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Mr. J. TROWBRIDGE BAILEY has left for the West on an extensive trip. Communications for him should be addressed to Idaho Springs, Colo.

IT seems, from statements that appear worthy of belief, that there is a movement among Western manufacturers of iron to provide for a scaling down of the prices paid to labor. It is well known that the relations between the finishers and the puddlers in the mills are by no means harmonious, and it is possible that a brief struggle only will decide the question of wages when brought up.

IN response to the wishes of a large number of persons, the body of PETER COOPER will be placed in All Souls' Church, corner of Fourth avenue and Twentieth street, this morning, at nine o'clock. The funeral services will take place at three o'clock in the afternoon. Seats will be reserved for the family, and the pews on the middle aisle will be kept for such committees and public bodies as have expressed a desire to be present. The remainder of the church will be open to the public.

As we go to press, we are in receipt of the annual report of the Horn-Silver Mining Company, the largest single lead-producer in this country. We shall deal with it in detail next week, and need only state now that it shows that the company had a prosperous year, having produced 44,782 tons of ore, running 37·8 per cent of lead and 34·2 ounces of silver. The receipts, notwithstanding the decline both in silver and in lead, were $3,385,811.68, while the cost of mining, smelting, and refining was $1,800,230.92. The cost of mining has been carried down from $5.15 to $4.44, that of smelting from $16.67 to $14.73 per ton of ore at the Francklyn smelter, and the cost of refining at Chicago from $11.03 to $9.05 per ton.

THE Lake Superior mines have taken a sudden turn in their policy, and are now freely offering copper at 16 cents, at which figure sales of some magnitude have been made. Other brands are correspondingly depressed, and range between 15 and 15¾ cents. It is too early now to discuss the bearings of this change of policy, which was probably precipitated by the inroads which Western copper made upon the markets of Lake. While the present range of low prices continues—and it will probably last some time, before production and consumption are readjusted—it is likely that the bulk of argentiferous mattes, notably those of Montana, will seek a market abroad.

In the light of the decline in the value of the metal, it may be of interest to glance at the figures at which some of the more prominent Lake Superior companies can produce copper. The Quincy, the largest on the lake after the Calumet & Hecla, produced in 1882 5,682,663 pounds of ingot, at an expenditure of $477,980, exclusive of construction, or 8·4 cents per pound, working rock containing 3·21 pounds of ingot: including $52,000 for construction, the cost will be 9·5 cents. The Calumet & Hecla works are ranging from 5 to 6 per cent, and, exclusive of an enormous sum paid out for new machinery, gave its shareholders a profit of $2,000,000 on a product of approximately 32 million pounds of copper. It is not probable that the bare cost of producing and marketing its copper costs this great mine more than from 7½ to 8 cents, if it is not less. With its new appliances, the mine will have little trouble to make up for its falling off in revenues, by reason of a lower price realized, by an increase in the quantity produced. Among the other mines, the Osceola, with a product of about 4,250,000 pounds of ingot, paid dividends footing up to $250,000 for the fiscal year, or approximately 6 cents per pound, leaving the cost between 11 and 12 cents. The Franklin, following next with a yield of 3,264,120 pounds of ingot, worked rock containing 22 pounds of ingot per ton at a cost of 10·7 cents for mining, crushing, and washing. Adding cost of smelting, freight, marketing, and general expenses, brings the cost up to about 13 cents. The Atlantic turned out 2,631,708 pounds from rock carrying only 0·693 per cent of copper, at a total cost of $1·9082, or 13·8 cents per pound. The Allouez, hampered as it was by the absence of a good stamp-mill, produced 1,683,557 pounds of ingot from very poor rock, running 17·31 pounds per ton, at a cost for mining and crushing of $2.60 per ton, or 15·04 cents per pound, to which added the smelting, freight, and other expenses, carries the cost to 17·38 cents per pound. The Pewabic is probably the weakest of the larger producers. It turned out 1,482,664 pounds for 1882. The rock was poor, running 20 pounds of copper per ton, while the cost of treatment was $3.03, or 15·1 cents per pound. Adding about 2 cents per pound for smelting, freight, marketing, etc., would make the cost, delivered, fully 17 cents. We have no data as yet relating to the Central, while the figures for the Huron and Ridge are given elsewhere.

From this *résumé* of the cost of production of the Lake Superior copper mines, it will be seen that all the important producers, with the exception of the Pewabic, will not be threatened with ruin by a price approximating 16 cents only. As they represent a product of fully fifty millions of pounds of copper out of a probable yield of fifty-seven or fifty-eight millions, it will be seen that there is no prospect of any serious check in the output of the Lake Superior mines. In fact, it is possible that there will be a further increase, however much the dividends may shrink. How many of the Western mines will fare, with prices as low asnow, is another matter. It is practically impossible, in view of the widely differing conditions, to make any estimate of their capacity to stand the strain. The Copper Queen and the Clifton mines in Arizona, and a number of others in New Mexico, Utah, and Montana, make copper at a low figure, because either of exceptionally high grade of ore or good facilities for the receipt of fuel supplies and the shipment of metal. At a price of 15 cents in New York, black copper is worth from 10 to 13 cents at the mine only, according to rates of freight and purity of metal. In districts like the Globe, of Arizona, where English coke costs from $65 to $70 per ton and the freight to market is correspondingly high, the cost of smelting oxidized ores will not fall much below from $16 to $20 per ton, which makes the working of any ores lower than from 10 to 12 per cent practically impossible. Unless the railroad companies lend a number of the Western enterprises a helping hand in the way of a reduction from the present high rates, many works, especially those lacking a substantial backing of capital, will have to close down.

## PETER COOPER.

The departure of Peter Cooper was the peaceful close of a memorable life. If ever the contemplation of death can be not merely without terror, but even without pain, it is in such a case as this, where, surrounded by the loving circle of children to the third and fourth generation, and by hosts of warm personal friends, loaded with well-earned honors and cheered with the enthusiastic affection of the civilized world, a man who has done great things for his kind goes in the ripeness of age to his rest and reward.

Peter Cooper had long outlived his proper contemporaries; and this generation, which knew him best as a benefactor, had never known him as a bold inventor and enterprising pioneer in great business adventures—still less as an industrious mechanic, practicing a patient perseverance and a frugal economy which seem nowadays to have gone somewhat out of fashion. It is hard to realize that his life covers nearly the whole history of the United States. Born in the middle of Washington's first presidential term, when the population of the country was about 4,000,000 souls, he lived to see it the most powerful of Christian nations, containing more than 53,000,000 inhabitants, triumphant over internal rebellion, fearless of foreign foes, and filled, from one ocean to the other, with appliances of science and monuments of human skill not dreamed of in his boyhood. Except the stationary steam-engine, which had just begun to be generally used when he was born, Peter Cooper witnessed the inception and growth of all the great material improvements which make our modern life what it is. Many of them, notably the railway and the telegraph, he essentially assisted in the days of their feeble beginnings; and his characteristic attitude toward them all was one of encouragement and hope. He was an optimist of the most wholesome type, not believing that things are well enough as they are, but full of a sublime faith that things can be bettered, and ready to welcome with sanguine support all attempts to better them.

In this, as in many other particulars, the history of Peter Cooper is distinctively American. No other country, in the early years of this century, could have given free scope to the versatile ingenuity and unconquerable perseverance with which he turned from one trade to another, until he planted his foot upon the road to fortune. Under other institutions, he would have remained a hatter, like his father, or become a brewer or a coach-maker, after once beginning in either of those trades. But in this free atmosphere, he was able to follow each path that offered itself, to master each business that he undertook, and to leave it for another that promised larger scope. He failed in nothing; each step was an advance; and when at last he took up the manufacture of glue and isinglass, the principal occupation of his life, he pursued it with an unwearied and unconquerable ardor as truly American as his versatility.

Another peculiar feature of his career was his conception of the uses and duties attached to wealth. He felt bound by the very fact of his prosperity not only to relieve the unfortunate, but also to organize agencies which should permanently benefit the city, the growth of which had been the basis of his own success, and the working-classes, by whose co-operation all great fortunes are built up. The absence of governmental endowments for charity and for learning has always rendered the claims of these objects upon individual g nerosity stronger in this country than elsewhere. Public spirit has done among us more than official action could have accomplished; and this spirit, fostered by our political system, has gathered strength through the inspiration of great examples, among which that of Peter Cooper is one of the most conspicuous, and has been perhaps the most fruitful. Notable as have been the results directly flowing from his beneficence, they are insignificant compared with the indirect consequences of the noble contagion which his enthusiasm communicated to other men. It is impossible to measure the effect of his example, showing as it does both sides: the joy and potency of a wise benevolence, and the immediate reward which it commands in the affection and praise of all mankind.

We had intended, in commencing this article, to emphasize particularly Mr. Cooper's earlier achievements, and their relation to the progress of the arts. But goodness is more than greatness; and we feel that the universal feeling is right when it mourns to-day the departure, and rejoices in the history, not of the ingenious inventor, the successful manufacturer, or the enterprising capitalist, but of the lover of men, whose widest schemes, like his most trivial acts and words, uttered his inmost disposition. The Cooper Union, planted by his hand, and tended with daily assiduity by him to the last, bears in every part the indelible marks, not merely of the man's wisdom or philanthropy, but of the man's self. As his benign face has been for years a most frequent and familiar object within its walls, so his gentle soul pervades and inhabits it forever.

For a good many years past, it has been my pleasant duty to take charge of the Saturday evening free popular lecture course at the Cooper Union. Of the thousands who attended these lectures, not one was more punctual and regular than Peter Cooper, and his entrance upon the platform was invariably the signal for an outburst of affectionate welcome. When he spoke, which was but seldom, his simple, cordial utterance had but one burden—the lesson of good will, which his paternal bearing also mutely spoke. As I have witnessed the touching intercourse between that vast, reverent audience and their venerable benefactor, I have often been reminded of the beautiful legend of St. John, who, in his old age, carried to the assemblies of the church at Ephesus, said evermore but this: "Little children, love one another." It was fit to be the last word of an evangelist, apostle, and seer; and it was in substance the word to this generation of one whose life exhibited not unworthily the spirit of the Beloved Disciple.

It is this identification of the man's nature with his actions, rendering them the complete expression of himself, "in whom there was no guile," that wins for Peter Cooper not merely admiration and praise, but the unanimous, ungrudging, rejoicing acclamation of that voice of the people which never more truly echoed the voice of God.

"Not what we give, but what we share!
For the gift without the giver is bare.
Who bestows himself with his gift, feeds three:
Himself, his hungering neighbor, and Me!"

It is impossible, even for those who feel most nearly this bereavement, not to find greater cause for thanksgiving than for grief. The long, noble, fruitful life; the painless end; the fragrant memory; the immortal glory—these have no room for tears.

Now, God be thanked for such a gift!
A human life, so strong, so sweet,
So blessed, so blessing, so complete,
So fit before the world to lift

For pattern and encouragement;
For silent love and echoing praise;
For teaching how earth's wasting days
In heavenly uses best are spent;

What guerdon tireless toil commands;
What triumph waits our enterprise;
How he who serves his kind shall rise,
Upborne upon their grateful hands!

His goodness struck detraction dumb;
He drew the heart of all to his,
And lent unto the life that is
The brightness of the life to come!

Rossiter W. Raymond.

## NEW PUBLICATIONS.

The Mineral Wealth of Virginia, *Tributary to the Lines of the Shenandoah Valley and Norfolk & Western Railroad Companies. By* Andrew S. McCreath, *Chemist to the Geological Survey of Pennsylvania, etc., etc.* Harrisburg, 1883. Octavo, 105 pages.

This book is the result of the new management inaugurated a year ago for the important railroad system named in its title. The determination of this management to make the railroads prosperous by developing as sources of income all varieties of natural wealth in the country traversed by them led to the establishment of a Bureau of Mining Intelligence, under the charge of Mr. J. B. Austin, at Roanoke; and Mr. McCreath was selected as an expert to examine with Mr. Austin the region tributary to the roads. The selection was a good one, the work has been carefully done; and the resulting report is an interesting general survey of the subject.

We extract and tabulate, without comment, the following estimates of the cost of making pig-iron at various localities:

| | I. | II. | III. | IV. | V. | VI. | VII. | VIII. | IX. | X. | XI. | XII. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ore..... | $4.50 | $4.73 | $4.79 | $4.79 | $3.40 | $9.37 | $9.00 | $7.60 | $9.61 | $9.34 | $11.81 | $9.46 |
| Fuel..... | 5.25 | 4.46 | 3.69 | 3.25 | 3.88 | 5.02 | 5.40 | 7.00 | 6.67 | 5.30 | 3.39 | 5.64 |
| Limestone | .30 | .50 | .75 | .60 | .50 | 1.00 | .85 | .56 | .95 | .77 | .77 | .42 |
| Labor..... | 1.50 | 2.00 | 2.10 | 2.00 | 2.00 | 2.35 | 2.10 | { 3.00 | 2.45 | { 2.33 | { 2.00 | 1.59 |
| Incid'ntals | 1.00 | 1.25 | 1.25 | 1.25 | 1.25 | .48 | 1.00 | | | { 2.64 | | .76 |
| Total... | 12.55 | 12.94 | 12.58 | 11.89 | 11.03 | 18.22 | 18.35 | 18 16 | 19.68 | 20.38 | 17.97 | 17.87 |

I. Cost at Milnes, Va. (2¼ tons ore, 1¼ tons coke, per ton of iron).
II. Estimated cost at Buchanan, Va. (2½ tons ore, 1⅜ tons coke).
III. Estimated cost at Roanoke, Va. (2½ tons ore, 1¼ tons coke).
IV. Estimated cost at Central, Va. (2½ tons ore, 1¼ tons coke).
V. Estimated cost on New River, Va. (2½ tons ore, 1¼ tons coke).
VI. Estimated cost in Middle Pennsylvania (fuel, coal and coke).
VII. Estimated cost at Harrisburg (2¼ tons ore, 1½ tons coal).
VIII. and IX. Estimated cost at two furnaces of the Lower Susquehanna District, a considerable distance apart and on different railroads.
X. Estimated cost in the Lehigh Valley District.
XI. Estimated cost at Pittsburg, Pa. (Lake Superior ore, 1¾ tons).
XII. Estimated cost at Phillipsburg, N. J. (fuel, anthracite).

An inspection of these figures shows that the advantages of Virginia lie chiefly in the cheapness of the ore. Mr. McCreath presents a list of mines which furnish Bessemer ores, twenty-three in number. Of these, we should be inclined to throw out nine, as coming too near the forbidden limit of phosphorus. Mr. McCreath, by the way, puts that limit at 0·14 per cent on the iron in the ore, or 0·13 in the pig manufactured. This may do for Bessemer manufacturers who make their own pig; but we have seen the requirements enforced not long ago by Harrisburg works on outside makes of Bessemer pig; and, according to our recollection, they set the maximum of phosphorus at 0·09 per cent.

In conclusion, Mr. McCreath sums up as follows the advantages for iron-making possessed by this region:

"The ores are abundant, and generally of good quality; they can be econo

mically mined; for the country in many localities is broken up by numerous ravines affording natural openings for mining operations; most of the deposits are within convenient distance of the railroads, with easy down grades; the water supply, either for washing ore or for manufacturing purposes, is ample and permanent at all seasons; limestone for fluxing purposes exists in unlimited quantities; and the railroad facilities for reaching markets in every direction are unusually good—thus forming a combination of favorable circumstances rarely equaled."

The next meeting of the Institute of Mining Engineers is to be held at Roanoke. *

GEOLOGICAL SURVEY OF NEW JERSEY. *Annual Report of the State Geologist for the Year* 1882. Camden, 1882. Octavo, 191 pages. (Index, and a Geological Map of the State.)

In this volume, as in each of its many predecessors, Professors Cook and Smock have presented a most useful summary of the progress of their work and the current developments of the industries of the State. The different chapters treat successively of the United States Coast and Geodetic Survey of New Jersey; Topographical Surveys; Geological Work in Progress; Seaside Developments; Climatic Peculiarities; Agricultural Development in Southern New Jersey; Drainage; Water Supply; Statistic of Ores, Clays, and Clay Products and Lime; and the publications, *personnel*, expenses, and plans of the survey. The most interesting chapters to us are the geological and statistical ones. Professor Cook is proceeding with characteristic caution and thoroughness to attack the difficult problem of the age and stratigraphical relations of the red sandstone district and its intercalated traps. In this volume, he presents a mass of observations, without professing to have collected data sufficiently abundant and precise to permit an assured induction. Concerning the geographical history of this district, he says:

"The hypothesis we are at present disposed to follow is, that the various detached portions of this general formation which are found east of the Appalachians, and extending from Massachusetts to South Carolina, were once, in some way, connected; and perhaps, also, those farther northeast in the British provinces. That after their deposition on a very uneven bottom, the underlying rock has been disturbed by a number of axes of elevation, or else of great faults, which have crossed the formation obliquely but in a direction much nearer north and south than the general trend of the formation. . . . The elevation of these axes would give a general dip of W.N.W. on one side and E.S.E. on the other, but not at right angles to the trend of the formation; and it would not require so great a thickness for the whole mass as has generally been computed. After this process of elevation was well advanced, the eruption of the trap-rocks began, and must have continued for a long period of time. The peculiar curved form of the trap ridges would necessarily occur where the upward force of the eruptive rock was applied against the inclined surface and pressure of the stratified rocks. The denudation of the surface, to the extent of from 100 feet to 600 feet or more, took place after this, but mainly before the Cretaceous period. By denudation, the softer sandstones and shales have been removed to so great an extent as to leave some portion of the Archaic and Silurian rocks entirely uncovered, to leave the red sandstones and shales in the deeper troughs between the axes of elevation, and to leave the hard eruptive rocks, which were but little above the other rocks, now standing out above the plain surface of the denuded sandstones and shales in the long, rocky, and rough ridges which are so prominent a feature of our Triassic formation."

Some trivial criticism might be applied to this statement. The ascription of force to mere "axes of elevation" is an unfortunate use of words; and the limitation of the effect of this force, or of faults, to "the underlying rocks," intimated by the language employed, is evidently not intended. We presume also that Professor Cook means "Archæan" when he says "Archaic." Apart from these small blemishes of expression, the hypothesis here suggested seems to us more probable than those of Rogers, Kerr, Heinrich, and others who have written on the subject. Elsewhere in this report, Professor Cook speaks of the rarity of clear exposures of faults in the sandstone formation. But the probability of the existence of many small dislocations is not only indicated, we think, by the rock itself, but by the analogous fractures of the crystalline rocks on the northwest. A system of oblique axes of elevation, with oblique subordinate faulting movements, is just what the phenomena of the Jersey gneisses suggest; and it is no small argument for Professor Cook's hypothesis, that it promises to harmonize the two halves of the State, by referring the structure of both to similar continental strains.

The mineral statistics of New Jersey for the year 1882 are given by the report as follows:

| | | |
|---|---|---|
| Iron ore carried by railroads | 897,183 | tons. |
| Received at furnaces by team | 35,579 | " |
| Total | 932,762 | " |
| An increase over 1881 (737,052 tons) of | 195,710 | " |
| Product of zinc ores (used at Newark and Bethlehem) | 40,138 | " |
| Product of clay, feldspar, kaolin, fire-sand, and molding-sand in Middlesex County | 315,000 | " |
| Ditto in Camden County | 38,100 | " |
| Total manufacture of bricks (an increase of 34,000 thousand over 1881) | 150,000 | thousand. |

The subjects of water supply, including rain-fall, drainage, wells, etc., are treated at considerable length; and the nature and amount of the supply of the principal cities of the State are described. The principal expenditure of the survey has been for topographical work. The annual appropriation is $8000; and this book shows that a good deal is done with that small sum. Such workmen, in such a work, ought to have more means. *

AN INDEX TO THE POPULAR SCIENCE MONTHLY. New York: D. Appleton & Co. 1883. 8vo, pp. 169. Price, $1.

The title index to the twenty volumes of the *Popular Science Monthly*, from 1872 to 1882, just issued, will be welcome to the readers of that progressive review.

THE WORLD'S PRODUCTION OF SULPHURET COPPER ORES. Issued by the Coxheath Mining Company, Boston. 8 pages.

This little pamphlet contains a good review, from the pen of Mr. Joseph W. Revere, of the principal localities from which sulphuret copper ores are obtained in this and other countries.

CAMERON'S PLASTERER'S MANUAL. Revised Edition. By K. CAMERON. New York: William T. Comstock. 1883. Sq. 12mo, 67 pages.

Mr. Cameron has published a revised edition of his Plasterer's Manual, having added a number of illustrations and recipes, and a new chapter on practical suggestions and precautions. It is intended for and well serves the purposes of apprentices, to whom a good guide of the kind will prove valuable.

## OFFICIAL STATEMENTS AND REPORTS.

### THE ALLOUEZ MINING COMPANY, LAKE SUPERIOR, MICH.

According to the statement of the directors of this company, the product of the mine during the year 1882 was 2,299,445 pounds of mineral, yielding 73·22 per cent, or 1,683,557 pounds of refined copper, for which, estimating the copper on hand at the close of the year (396,690 pounds) at 18 cents per pound, there was realized an average price of 17·86 cents per pound, or $300,818.19. The profit, after deducting the total working expenses, was only $8268.46; but as $20,347.05 were paid out for buildings, real estate, and machinery, there was a deficit of $12,078.59, which reduced the net surplus of December 31st, 1882, from $87,120.74 to $75,042.15 in the beginning of this year, provided the copper on hand realized 18 cents. The company did a very large amount of dead-work, which increased current expenses, and which also brought down the average yield of the rock. As the surplus consists of supplies, the company levied an assessment of 50 cents per share, or $40,000, to provide for improved machinery. The mining work embraced 327 feet of shaft sinking, at $26.93 per foot; 54 feet of winzes, at $15 per foot; 1498·4 feet of drifting, at $11.71; 51 feet of drifting for pillars, at $13.86 per foot; 813·7 fathoms of rising slopes, at $8.64; 2324·9 fathoms of stoping with power drills, at $8.05 per fathom; and 2619·3 fathoms of stoping by hand at $10.88; the cost of running the compressor and power drills, inclusive of repairs, being $10,370.51. The wages paid to timber-men, trammers, blacksmiths, etc., were $37,966.14, to which, added supplies, makes the total for underground expenses $139,069.08, or, less profit on supplies sold to contractors, $8846, $130,223.08. In all, 112,892 tons of rock were mined; 107,079 tons were hoisted, at an expense of $19,594.45, of which $2664.64 went for wire rope and supplies, $9860.80 for fuel, and $7069.01 for labor. The cost of breaking and selecting the rock was $22,698.78, a figure which seems high in view of the slight quantity of rock finally rejected, not quite 10,000 tons. The heaviest item is labor, $14,016.58, followed by $4835.60 for fuel, and $3788.75 for castings and supplies. The surface expenses were $11,742.23, including $8808.36 for salaries and wages, $2495 taxes, $1512.41 insurance, and $1550.50 supplies. The railroad carried 97,232 tons of rock at a cost of $13,203.75, which was crushed in the stamp-mill at a cost of $53,987.77, including $24,470.91 for 7528 cords of wood, or one cord per 12·9 tons, $20,396.03 for labor, $3589.36 for supplies, and $5531.47 for repairs. Among the mineral expenses, $5028.41, figures transportation to Hancock, $3783.96. Reduced to cost per ton of rock milled, those figures stand as follows:

| | |
|---|---|
| Mining | $1·3393 |
| Hoisting | ·2015 |
| Selecting and breaking | ·2335 |
| Surface expenses | ·0867 |
| Transportation to mill | ·1358 |
| Milling and washing | ·5552 |
| Expenses on mineral | ·0517 |
| Total per ton milled | $2·6027 |
| Total per ton mined | 2·2426 |

The yield of copper per ton mined was 14·91 pounds, and per ton milled 17·31 pounds, or 256 pounds of refined copper per fathom of ground broken. The cost of mining and milling copper for the Allouez was, therefore, 15·04 cents during 1882. To this, however, must be added $39,381.39 of other expenses, including $8332.08 for freight, $22,351.63 for smelting (1·33 cents per pound), $1683.75 for commissions and brokerage, and a number of sundry expenses, or 2·34 cents, making the total 17·38 cents per pound.

In the machinery purchased, we note a Rand duplex, 16½ by 30, compressor, costing, with freight and labor, $5752.91; eight Rand drills, $3628; a Worthington duplex pump for the mill; and a small Knowles pump for the mine.

Mr. Frederick Smith, the agent, speaks encouragingly of the mine. He advises the addition of the second half of the compressor, so that all underground work can be done with the power drills.

### RIDGE COPPER COMPANY, LAKE SUPERIOR, MICH.

The annual report of the Ridge Copper Company is interesting, because it is one of the smaller mines whose existence is seriously threatened by the recent decline in copper. The product of the mine was 102,936 pounds of copper, which, including the mineral at the mine, realized only $17,097.44, while the mine and other expenses were $36,482.08, leaving a deficit of $19,384.64. An assessment of $10,000, or 50 cents per share, was levied; but it was difficult to collect it, 2476 shares being forfeited. The directors ask the stockholders for consent to sell, notwithstanding the urgent request of the agent, Captain S. B. Harris, to continue work. The Ridge paid $50,000 dividends on February 24th, 1873; $20,000 on February 23d, 1874; the same amount on February 8th, 1875, and $9784.50 in 1880, making a total of $99,784.50. On the other hand, assessments to the amount of $210,000 have been levied.

### HURON COPPER MINING COMPANY, LAKE SUPERIOR, MICH.

The work of the Huron has been largely one of preparation, and the expenditures have been excessive on account of the necessity of hauling rock to the old Pewabic mill, the old Huron mill being almost useless. Work in building the new mill was begun on the 1st of December, and it is expected that the mill will be ready for work early in the season. During the year, 269 feet of shafts, 261 feet of winzes, and 886 feet of drifts were run, at a total expense of $57,626.87, including timber, supplies, wood, etc. Surface expenses footed up $19,581.80, and the expense of crushing 8552 tons of rock, yielding 2·52 per cent of mineral, was $10,018.39. Diamond drill explorations on the conglomerate vein cost $695.46; construction expenses, $4380.28, and all other expenses were $6329.48. The total product was 445,624 pounds of mineral, yielding 82·113 per cent of copper, or 364,037 pounds of ingot, of which 292,500 pounds were sold at an average price of 18·355 cents. The total receipts were $135,234.46, including $21,701.23 cash on hand, and a loan of $54,000, of which $32,500 were paid and were included in the expenditures, leaving the cash on hand $2425.94. The assets include copper on hand and supplies, a total of $45,510.26; the liabilities being $67,144.72. The agent's valuation of the machinery and buildings is placed at $124,201.41. Mr. J. Vivian, the superintendent, reports that a very good piece of ground has been opened on the seventh level, the lode being from 18 to 20 feet in width.

## THE NICHOLS FURNACE.

In order to lessen the cost of transportation, Messrs. Nichols & Co., of the Laurel Hill Chemical Works, Long Island, New York, some time since themselves began the smelting of the cinders obtained after roasting cupriferous pyrites in kilns, for the manufacture of sulphuric acid. Under the direction of Mr. J. B. F. Herreshoff, experiments were made with the view of improving the construction of the ordinary furnaces, and the result of these efforts was the construction shown in the accompanying illustrations. As will be seen, the furnace has the general type of modern American copper furnaces, the main point of novelty in the design being the construction of a removable outside well or hearth. The principal object is to separate from the furnace proper that part which is particularly liable to create stoppages and repairs, so that runs over long periods can be made. The entire product of the furnace flows directly into the well. Near the bottom of the furnace is an opening, 7 by 6 inches, the circle of the furnace being flattened at this point to allow of close contact with the water-jacket face of the well. The face of the well is formed by two square frames of wrought-iron, covered by soft sheet-steel or boiler-iron, in such a manner as to leave a water-space between, and the smaller inner frame corresponding in size and hight to the opening in the furnace. The well itself is built of ribbed cast plates, bolted together, lined with fire-brick and mineral wool, to prevent chilling, and mounted on wheels, with a flat-arched brick-lined cover. Near the top, on the side away from the furnace, is a regular slag-spout, and below on one side a tap-hole and spout for the metal, which can be tapped at intervals; or, in case of lead, a small outside dipping-well can be bolted on, as usual, on the furnace itself. The offset shown in the upper part of the well is not necessary. It is preferred, especially with basic slag, to have it straight, to avoid cutting by the upward flow of the slag. The well is guided to its place against the furnace by the two outside rails. Rubber hose connections are attached to the water supply pipes, and then the blast is let on to the furnace. Any slag which might naturally leak between the two faces is immediately chilled, and forms a perfectly tight packing between them.

The following is a record of a number of the furnaces at the Laurel Hill Works, for a number of days, as taken from the charging-books. The 48-inch furnace was first built; then the 60-inch, which, however, proved of too large a diameter, when the 36-inch by 66-inch furnace was erected.

As already stated, the ore was pyrites, containing between 3 and 4 per cent of copper, the fuel employed being common gas-coke. We may add that the inventors have made arrangements with Messrs. Fraser & Chalmers to build the furnaces as modified:

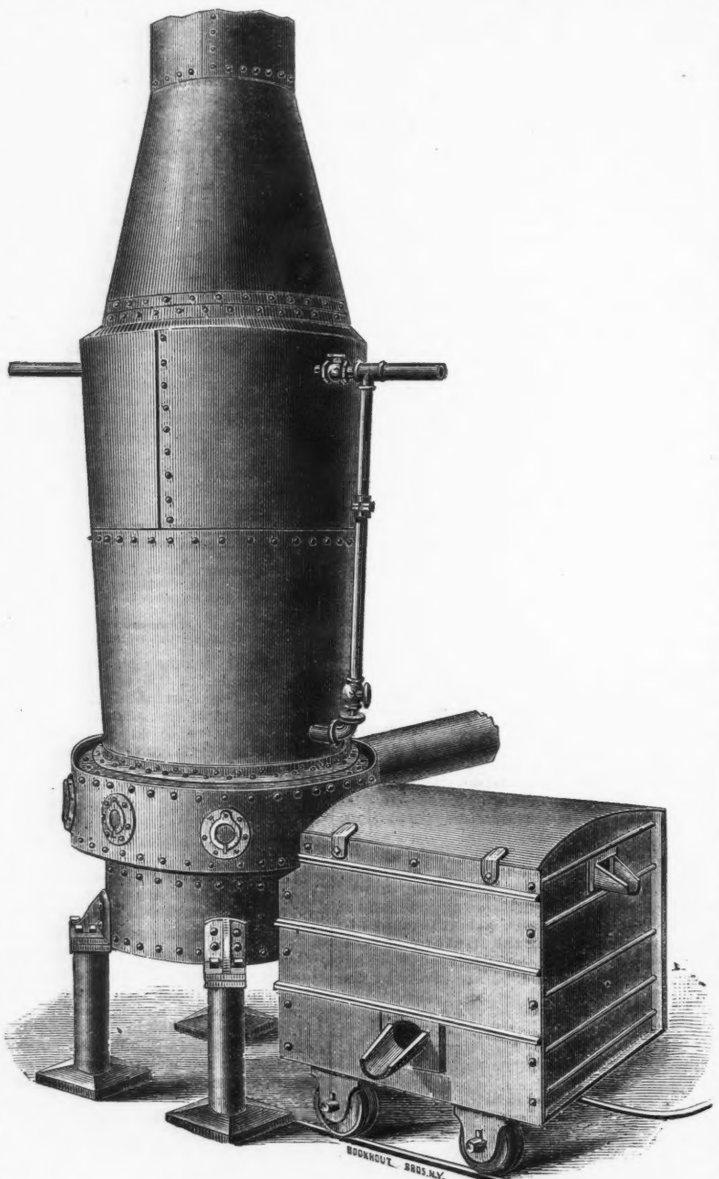



FIG. 1.—THE HERRESHOFF DETACHED FURNACE-WELL.

48-INCH CIRCULAR FURNACE.

| Pounds. | Pounds. | Pounds. | Pounds. | Pounds. | |
|---|---|---|---|---|---|
| 106,640 | 99,680 | 107,310 | ..... | . ... | Roasted ore. |
| 13,760 | 11,840 | 710 | ..... | ... .... | Raw fines. |
| 22,870 | 21,812 | 24,051 | ..... | ... .... | Coke. |
| 6,880 | 6,560 | 6,360 | ..... | .... .. | Common sand. |

60-INCH CIRCULAR FURNACE.

| Pounds. | Pounds. | Pounds. | Pounds. | Pounds. | |
|---|---|---|---|---|---|
| 127,300 | 130,760 | 132,140 | 132,840 | 135,680 | Roasted ore. |
| 13,000 | 18,580 | 16,520 | 19,680 | 16,850 | Raw fines. |
| 32,200 | 34,160 | 34,440 | 34,440 | 34,400 | Coke. |
| 23,000 | 24,400 | 24,600 | 24,600 | 24,600 | Common sand. |
| 18,400 | 19,520 | 19,680 | 19,680 | 19,680 | Iron slag. |

36-INCH BY 66-INCH FURNACE.

| Pounds. | Pounds. | Pounds. | Pounds. | Pounds. | |
|---|---|---|---|---|---|
| 124,830 | 136,800 | 156,000 | 171,660 | 175,200 | Roasted ore. |
| 32,850 | 36,000 | 15,000 | 25,000 | 23,360 | Raw fines. |
| 30,660 | 33,600 | 33,400 | 36,120 | 40,880 | Coke. |
| 10,960 | 12,000 | 13,500 | 2,000 | 14,600 | Common sand. |

## TESTS OF EXPLOSIVES.

In the Proceedings of the U. S. Naval Institute, Prof. Charles E. Munroe, U.S.N.A., has reviewed a report on vigorit powder, made by Lieut. W. R. Quinan, U.S.A., General Superintendent of the California Vigorit Powder Company, which contains interesting data on the methods of testing explosives employed. These Professor Munroe considers sufficiently trustworthy for the object in view, although somewhat rough and not wholly new. Professor Munroe summarizes the contents of the report, of which a copy has not yet reached us, as follows:

The iron plate and éprouvette tubes were discarded as delusive or as being advantageous to slow-burning powders, and a simple form of the "crusher-gauge," with lead cylinders, was employed. This gauge consisted of a heavy iron base, supporting four vertical wrought-iron guides, which were connected at the top by a ring. The lead plug is placed on the base; a piston weighing 12½ pounds rests on the plug. The top of the piston is hollowed out to receive the charge, and over this is placed a 34½ shot of tempered steel. The shot is bored through its axis, to receive a capped fuse. All these parts are between the guides; and when the charge is fired, the piston is driven against the plug, while the shot is thrown out in the opposite direction. To determine the pressure exerted in compressing the plug a given amount, a foot-pound machine was constructed similar in form to a pile-driver with a graduated scale, the shot of the pressure-gauge serving for the hammer and the piston of the gauge for the anvil. This form of apparatus realizes more perfectly than any other the conditions which exist when explosion takes place in a confined space. Tests were made of cast and drawn lead plugs. The cast lead ones were unsatisfactory, while the drawn ones gave very regular results. An apparatus similar to the foot-pound machine was used for testing the sensitiveness of the powders to percussion, and, with the addition of a gas-pipe and wooden tamping-rod, to tamping. With this tamping apparatus, the vigorit powder, as now made, withstood more than a dozen blows of 300 foot-pounds each. The ability to tamp a powder is regarded as quite important, since it enables the miner to put the powder where it will do the most efficient work; hence a powder which can be tamped freely will be found more economical than one which is too sensitive to be tamped at all.

The friction apparatus consisted of a heavy block covered with sand-paper, resting on a board covered in a similar manner. By means of a long handle, the block could be drawn backward and forward. The relative leakage of nitro-glycerine from the various powders was determined by placing equal weights upon weighed slips of bibulous paper for equal times, and then measuring the increase in weight of the papers.

Tests as to the effect of fire were made by ramming vigorit powder into an iron pipe until the pipe showed signs of yielding under the pressure. One end of the pipe was stopped by a wooden plug tightly driven in, and the open end was lighted by a match. The powder burned without explosion. Again, a large cartridge was placed in a small strong box, the lid being securely fastened with screws. A fuse passing through a small hole in the side of the box served to light it. The cartridge burned up without explosion, the box being badly charred on the inside, but not broken.

Lieutenant Quinan regards the property of deliquescence as a most serious one in mixed powders. The progress of deliquescence is thus explained

The air confined in the cartridge contains a slight quantity of moisture, which, in uniting with the salt, causes a depression in temperature, which condenses fresh moisture from the surrounding air. This being taken up, reduces the temperature still more and brings a fresh supply, and so on. The process continues until arrested by an outside elevation of temperature, when the action is reversed. In losing moisture, the heat rendered latent is given out, raising the temperature, which causes a fresh loss of moisture and further elevation of temperature, and so on, till a change in atmospheric conditions arrests this process and induces a contrary. This gives two different and incompatible characters to a powder in which deliquescent salts are used, depending upon the particular state in which it is taken; when absorbing moisture, it is comparatively weak and insensitive to blows or compression; when losing moisture, it is comparatively strong and very sensitive to both. The temperature being already elevated, a slight blow will raise it to the exploding-point. The compression given by the tamping-rod in compacting it in the bore-hole may be sufficient to cause a premature explosion. These qualities render the powder unfit to bear climatic changes, and especially dangerous in warm or drying weather. Its constant subjection to chemical action gives it a character of instability especially conducive to disasters in handling it. The powder which is safe to-day and dangerous to-morrow is the most dangerous of all.

The effect of heat on all powders is to bring them nearer their exploding-points, and thus to increase their sensitiveness. This heat makes a slight saving of work in explosion—so that all explosives are a little stronger in warm weather. The danger of deliquescent ingredients is not in lowering the firing-point of nitro-glycerine, but of elevating the temperature of the powder to a dangerous approximation to this point.

The author holds that while in dynamite, the absorbent being inert, the force is dependent upon the amount of nitro-glycerine present, the more modern powders do not depend entirely on this. Citing the experiments of Roux and Sarrau, which showed that, if a fulminate acted through the medium of nitro-glycerine, an explosion of the first order would be produced, he argues that a mixture of nitro-glycerine with the ingredients of gunpowder will develop a much greater force than the sum of the forces of the two fired separately. In this he differs with Hill and Mowbray, while he is supported by Drinker. He also claims that any thing in a powder which interferes with the transmission of the detonating impulse or wave will cause a diminution in strength through imperfect detonation. It requires 60 per cent of nitro-glycerine to make a powder of kieselguhr which can be depended upon to explode at all. As the nitro-glycerine is increased, the strength increases rapidly, through better transmission of the impulse. Even taking 75 per cent as the utmost which the powder will safely hold, the detonation is not perfect under ordinary conditions, though it approaches it more nearly as the impulse is concentrated by stronger confinement.

**A Scientific Centenarian.**—Rarely in the history of science, says the *Lancet*, has a distinguished career equaled in its length that of M. Chevreul, whose name is best known in connection with his investigations on color; and it is probably altogether unique for a *savant* to be able, before one of the most distinguished scientific societies in the world, to refer to remarks which he made before the same society more than seventy years previously. Recently, M. Chevreul made a communication to the Académie des Sciences, and at its close he observed: "Moreover, gentlemen, the observation is not a new one to me. I had the honor to mention it here, at the meeting of the Académie des Sciences, on the 10th of May, 1812!"

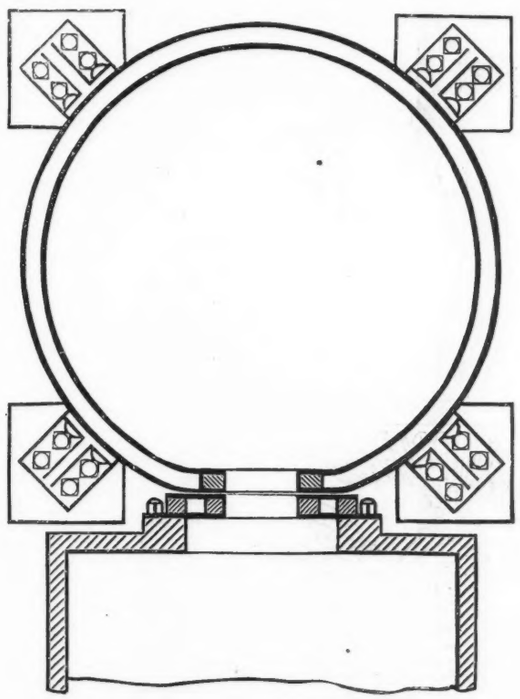


Fig. 2.—Horizontal Section Through Furnace.

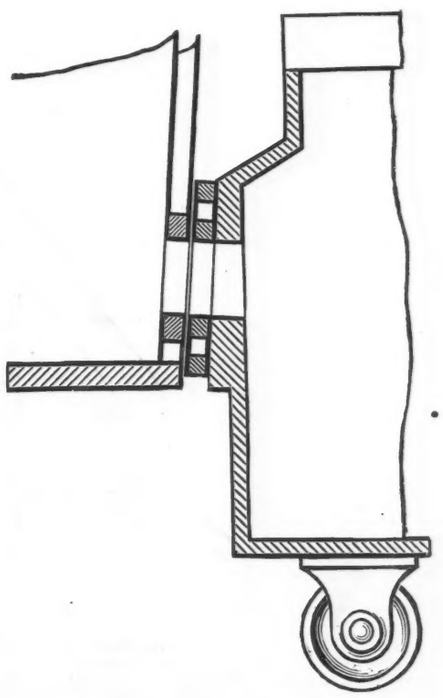


Fig. 3.—Vertical Section Through Furnace and Well.

## THE MOREY PULVERIZER FOR DRY CRUSHING.

The Morey & Sperry Mining Machinery Company has recently modified the construction of the Howland pulverizer, and, with slight alterations in the design, has adapted it to dry as well as wet crushing. The principal change made consists, as shown in the accompanying section of the dry-crushing pulverizer, in the substitution of balls for rolls. Through the gearing *K K* the disk and cone *H* is rotated, carrying with it the balls *B*, which are carried by centrifugal force against the concave annular ring *C*, which is cast in one piece of chilled iron, or is made of rolled steel in the same way as locomotive tires. The balls are surrounded by cages or guards *A*, in which they play freely. To give them greater strength, they are connected by a heavy ring. At the points along which the balls slide over the disk, a piece of flat steel is dovetailed in, to protect it against wear. In dry crushing, the machine is covered with a hopper, to feed the machine, and air circulation is provided by a blower or a suction-fan, the air passing upward through an annular space behind the ring *C*.

## THE CAREER OF PETER COOPER.

The venerable Peter Cooper, who died in this city after a brief illness, of pneumonia, on the 4th inst., was born on the 12th of February, 1791, his father being a hatter in this city, whose efforts in business were not successful, so that Peter, like the rest of the children, had to undergo many hardships during his youth and was denied the advantages of school except at intervals. His father moved from place to place a number of times, and engaged successively in keeping a country store at Peekskill, a hat-store, and a brewery, his son helping him in his work until he reached his seventeenth year, when he was apprenticed to a firm of carriage-makers in this city, with whom he remained until he was of age. During his four years of service, he had found work at carving wood for carriages, in which he became an expert. By doing this in his leisure hours, he was able to add to his slender income. The additional sums which he obtained he devoted to buying books and to paying for the services of a teacher in the evening. This period of his life taught him the value of evening schools, and it is said he then determined to devote his years to the accumulation of wealth, that he might found an institution where working boys and girls could find free instruction.

He launched out in business after having worked in a woolen factory at Hempstead, Long Island, where he invented a machine for shearing the nap from cloth, from the sale of which he realized considerable money. Then he became a cabinet-maker, only to continue the business one year, when he sold out to open a grocery store, which he removed within a year after he opened it; and finally sold out this business to carry on a glue factory—six changes in nine years. This might be regarded as an evidence or instability and fickleness. But at every step there was a movement for the better. He lost no money; on the contrary, he constantly increased his accumulations. The last change was for a permanency. He continued his business in the same place for twenty-five years; and when he finally made an alteration, it was only to build a larger factory on cheaper ground, and to remain a glue manufacturer until he died.

Ten years of this business had made him a rich man, as wealth was measured fifty years ago. He had accumulated a large surplus capital available for investment. One day, two men proposed to him that the three make a purchase of land in Baltimore, and offered him a third interest in 3000 acres at a price of $103,000. The land was within the city limits, and took in the whole shore from Pell's Point dock for a dis-

tance of three miles. Mr. Cooper paid his part of the purchase-money, but soon discovered that neither of his partners had paid any thing. He offered them $10,000 to withdraw, and they accepted it. The land was unprofitable; and in order to get a return for the investment, he built iron-works on the ground. He owned 400 or 500 tons of iron ore at Lazaretto Point, and determined to cut off the wood from the land and make charcoal iron. He built a rolling-mill and constructed furnaces twenty feet in diameter.

Those were the early days of railroads in America. Not a single locomotive had been constructed here. The Baltimore & Ohio Railroad Company had built only thirteen miles of its road, and was having so much difficulty with sharp curves as to think of abandoning the whole project. In the first year, they had expended all the subscribed stock, and the stockholders, thoroughly discouraged, had refused to pay any more. Mr. Cooper came to their aid by building a locomotive that would run on curves. When it was completed, he attached it to an open box-car, and with himself as engineer gave the directors a ride over the thirteen miles of road, covering the distance in one hour and twenty minutes; the returning trip was made in fifty-seven minutes. This decided the fortunes of the road, and it was then completed.

Mr. Cooper sold his Baltimore property to two capitalists, who formed the Canton Iron-Works, in the stock of which Mr. Cooper took a considerable part of the amount due him. The stock was taken at $44 per share, the par value being $100. It rapidly rose until it reached a valuation of $230 per share, when Mr. Cooper sold his interest. In New York, he built iron-works in Fourth avenue, near his glue factory, and during the next two or three years manufactured large quantities of wire. The mill, however, was used mainly in puddling and rolling iron. He then removed the iron-mill in Fourth avenue to Trenton, where he put up additional iron factories. He was the first person to manufacture railroad iron in this country. In planning his future "Cooper Union," he desired it to be fire-proof, but was unable to obtain the necessary iron beams. He then expended $75,000 in machinery for rolling beams such as are now used in building, being also the first person in the country to engage in this enterprise.

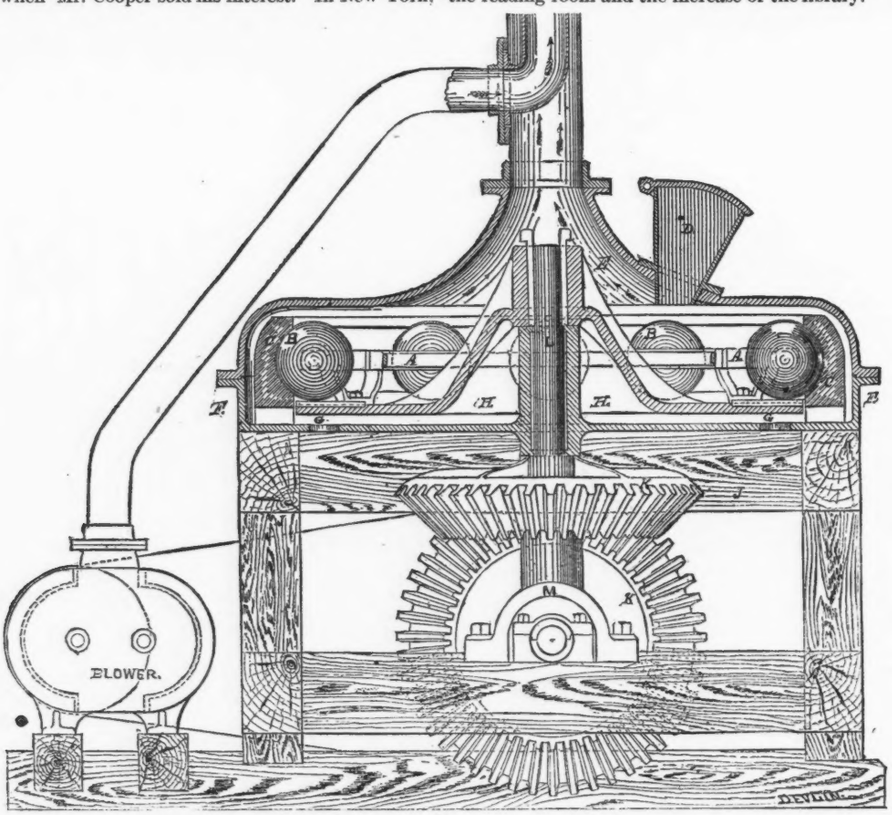
The Trenton venture proved successful, and the works were enlarged from time to time until they have become very extensive. At Phillipsburg, Pa., he built three large blast-furnaces, and he bought the Durham furnace, three miles from Trenton. The production of his mills was not confined to building and railroad iron, but included various kinds of wire, such as he had made in New York, and many other manufactures of iron. For the Durham furnaces, he paid $260,000. He also bought the Andover iron mines; and to transport the ore to his factory, he built a railroad eight miles in length over a rough country, on which he could transport 40,000 tons a year.

Mr. Cooper took an active interest in the development of the telegraph and cable system, being identified with a number of the earlier enterprises.

Twenty-five years ago, the foundation-stone to the Cooper Union was laid, and thus the enterprise realized which had been the aim of his life. A scroll was buried with the corner-stone, which bore the inscription: "The great object that I desire to accomplish by the erection of this Institution is to open the avenues of scientific knowledge to the youth of our city and country, and so unfold the volume of nature that the young may see the beauties of creation, enjoy its blessings, and learn to love the Author from whom cometh every good and perfect gift."

The school was "to be forever devoted to the union of science and art in their application to the useful purposes of life." Five years passed before the building was finished. It is a brownstone and iron structure, thoroughly fire-proof, of massive Roman architecture, an irregular quadrangle in shape, having dimensions on its four sides of 90, 146, 165, and 195 feet. Its original cost, exclusive of the site, which had been purchased about twenty-five years before for this very purpose, was $964,000. In 1869, Mr. Cooper gave a deed of trust of the property to a board of trustees, consisting of Mr. Cooper as president, Daniel F. Tiemann, Edward Cooper, Wilson G. Hunt, John E. Parsons, and Abram S. Hewitt. In the same year, $10,000 were given to meet the immediate wants of the institution, and $20,000 for the establishment of a museum. Other gifts made a total of $700,000.

Of the splendid success of the institution in supplying the want which it was intended to meet, a recent annual report of the curator gave ample evidence. Every department was full to overflowing. More than 3000 pupils had entered the various classes. Between 400 and 500 applications had been put on file, to await the retirement of those who already held places in the classes. The instruction and lectures which these pupils enjoyed were given to them absolutely without charge. The expenses of the various departments amounted to $50,769, all of which was derived from the rent of stores and offices occupying three stories of the building, from the rents of the larger and smaller halls for public meetings, and from an endowment fund of $150,000, chiefly designed for the support of the reading-room and the increase of the library.




THE MOREY PULVERIZER, FOR DRY CRUSHING.

## CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes.]

### Bessemerizing Copper Matte in a Reverberatory Furnace.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In response to Mr. Howe's article in your issue of March 17th, allow me to state the following concerning my suggestions as to a modified plan of copper smelting.

The facts which caused me to think of my plan were the following: In the second volume of *Jern Kontorets Annaler*, 1882, translated in the *Berg- und Hüttenmännische Zeitung* the same year, Dr. A. Tamm, of Stockholm, describes how copper matte was successfully treated in a converter at Eguilles, in France, when he was there in 1881. Dr. Tamm says, page 115: The temperature is raised during the process by the oxidation of the sulphur and the iron, this being indicated by a brighter color of the tapped product. In 1881, successful experiments were carried out at Kohlsva, in Sweden, in order to make steel in an open-hearth furnace, by blowing air on the surface of the molten pig-iron. These experiments had been suggested some two or three years before by Magnus Lindberg. These two facts suggested that, if it is possible to make steel in a converter as well as in an open-hearth furnace, and if copper matte can be bessemerized in a converter, the latter can be treated also in an open-hearth furnace. The latter method ought to be better for matte, because the slag can be skimmed off and the fluxing substances be put in. To oxidize a product in an open-hearth furnace by blast through inclining tuyeres is, as Mr. Howe knows, not new. In copper smelting they

employ in Germany and Hungary a so-called "spleiss-öfen," in which an impure coarse copper is treated by blast acting through inclined tuyeres on the surface of the bath, causing sulphur and arsenic to pass away as gaseous products, and scorifying iron, lead, tin, etc. In England, in many blister furnaces, two inclining holes are provided at each side of the furnace, near the fire-bridge, allowing the air to strike the surface of the bath, thus causing a more vigorous oxidation of the metal than when the air enters the side-door. It is obvious that this latter method is unsatisfactory. To propose heating by gas (as is now generally done in the metallurgy of iron), for the treatment of matte for blister copper, is very natural, considering that the main point in this process is a strong oxidizing flame, which is more slowly and incompletely obtained by employing a common coal furnace. The two facts, the successful treatment of copper matte in a converter in France, and the successful treatment of pig-iron for steel in an open-hearth furnace by blast through inclined tuyeres at Kohlsva, in Sweden, combined with the easily-regulated flame gained by employing gas-furnaces, were the only causes of my proposition to treat copper matte in the manner described by me.

I will now proceed to Mr. Howe's four points. When Mr. Howe read my plan and came to the two working-doors, he ought to have observed that in my description the working-doors were situated *opposite* each other, in the *middle* of the sides of the furnace. During all the time I was at Bergen Point, there was no smelting-furnace that had such doors. This had a natural cause, the furnaces being common draught-furnaces fired with coal, with one door at the side and the other at the end of the furnace. Mr. Howe thought, probably, that I was thinking of the ore reverberatory smelting-furnaces in England, where there is no need of more than one door below the flue. Mr. Howe had also a wrong idea about the two arches with a space between them. I proposed that the two arches with a space between them should go all along over the furnace. Not long ago, a beginning was made in using these furnaces in treating iron; but I do not believe that a single furnace built in this way is used in copper smelting. The so-called double arches of the furnaces at Bergen Point are only above and around the fire-place. Mr. Howe's fourth remark concerns the tuyeres. As for placing them, I can find no other reasonable way than that I proposed. As I hear from Mr. Howe, he has also tried to have them immersed and horizontal. I would not at all advise this in my plan, because, when I shut off the blast, to skim the furnace, the tuyeres would only be clogged up. If Mr. Howe will ask Mr. Gibb, Manager of the Elizabeth Copper-Works, he will tell him that he, many years ago, in England, made experiments by blowing air through inclined tuyeres on sulphide of copper, in order to hasten the oxidation. As Mr. Howe may thus see, there is nothing new in treating copper matte in a reverberatory furnace by inclined tuyeres. But I believe that no one has tried or proposed to treat copper matte as I have described it in the ENGINEERING AND MINING JOURNAL of March 3d, in a gas-furnace, using water-cooled inclined movable tuyeres. This combination I, for my part, consider to be an essential condition for the successful execution of the process.

PAUL JOHNSSON.

ISHPEMING, MICH., March 26, 1883.

We have made room in the above, in fairness to Mr. Paul Johnsson, to extracts from a long letter written to us by him, so far as he raises points of technical interest. In other portions of his communication, he alleges that he spoke to different officers of the Orford Nickel and Copper Company of his plans before he knew of the fact that they had experimented in the same direction or was acquainted with the details. As this part of the subject is not one on which a discussion is likely to interest the readers of the ENGINEERING AND MINING JOURNAL, we dismiss it.—EDITOR E. AND M. J.

### Rotary Pump.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Can you inform me who manufactures a centrifugal pump capable of forcing water 100 feet perpendicularly? I have seen such a pump of French manufacture working on the island of Cuba, throwing water 110 feet, and running at a speed of 400 revolutions per minute. C. B.

MANHATTANVILLE, March 31.

## THE CHEMISTRY OF THE BESSEMER CONVERTER.

On March 10th, Mr. J. E. Stead, F.I.C., F.C.S., the eminent metallurgical chemist, of the well-known firm of Pattinson & Stead, delivered an interesting lecture before the Cleveland Iron Trade Foremen's Association, Middlesborough.

The lecturer began by saying that the Bessemer converter was by far the most important metallurgical instrument of modern times. It had become even more important during the last few years since the discovery and practical development of the basic process, commonly called the Thomas-Gilchrist process, from the names of the inventors. By means of that system, as is well known, immense quantities of phosphoric pig-iron which have before been deemed to be unsuitable for making steel have been rendered in a commercial as well as chemical sense available for the Bessemer process. This fact—for, notwithstanding the contrary opinions of some authorities, it is a fact—is of special importance to such districts as that of Cleveland, where there is made annually an enormous quantity of phosphoric pig-iron, which might, by means of the new system, be converted into excellent steel.

Before entering upon the chemical details, Mr. Stead exhibited a series of views showing various kinds of Bessemer plants. These were, first, the ordinary old-fashioned English Bessemer pit, with a converter on each side, blowing in opposite directions; secondly, a more detailed view of the converter, with plan of plug and arrangement of tuyeres; thirdly, a plan of the Barrow Hematite Iron and Steel-Works; fourthly, a plan of the steel-works at Rhymney, South Wales, where the converters are side by side, and blowing in the same direction. The lecturer pointed out the great convenience of the Rhymney plant, where the blown metal, after being converted into steel and run into a ladle, is conveyed upon a carriage away from the hot converting-house to the casting-house, where the center crane has the full sweep of its radius for casting. He then exhibited a section of a basic Bessemer converter of the latest type, showing how its shape differs from that of the ordinary vessel, especially as regards the even taper from the body of the vessel to the nose, instead of the turned nose of the old-fashioned converter. This alteration has been made because it has been found by experience that, during the basic process, the quantity of slag and other things thrown out collected at the mouth of the vessel, and nearly choked it up. It is in the lining of the vessel that the first departure from the ordinary Bessemer process is noticeable in the basic system. The material for lining the ordinary vessel is ganister, the composition of which is as follows:

| | Sheffield ganister. No. 1. | | Sheffield ganister. No. 2. | | Good mixture. No. 3. | |
|---|---|---|---|---|---|---|
| Silica | 85·0 | to | 92·0 | per cent. | 91·20 | per cent. |
| Alumina | 4·0 | " | 8·0 | " | 6·00 | " |
| Peroxide of iron | 1·5 | " | 2·5 | " | 1·70 | " |
| Lime | ·1 | " | ·3 | " | ·25 | " |
| Oxide of magnesia | ·3 | " | ·5 | " | ·25 | " |
| Potassa | ·2 | " | ·6 | " | ·28 | " |
| Soda | ·3 | " | ·4 | " | ·32 | " |

What is wanted is a substance which will resist the action of very high heats, and be of such a plastic nature, when damp, as to hold together when placed in the converter. Thus it is very necessary to have about 6 per cent of alumina in the mixture, or otherwise it is too sandy, and is a useless lining. It is very important that, in choosing a ganister, only such stones as are very free from the alkalies, potash and soda, are selected, because these bodies, when present only in moderately large quantities, so affect the refractory properties of the bricks as to make them readily fusible at a high temperature.

| | Durham ganister. | Durham fire-clay. |
|---|---|---|
| Silica | 97.81 per cent. | 69·18 per cent. |
| Alumina | 1·50 " | 25·90 " |
| Peroxide of iron | ·35 " | 2·50 " |
| Lime | ·10 " | ·36 " |
| Oxide of magnesia | ·15 " | ·41 " |
| Potassa | ·16 " | 1·20 " |
| Soda | ·11 " | ·45 " |

In the Durham ganister, there is only 1·5 per cent of alumina. This is not enough, and such ganister is unsuitable for lining converters. The fire-clay has 26 per cent of alumina, but only 69 per cent of silica. This again will not do, because it melts away almost like treacle, because of the large quantity of potassa ($KO_2$) and soda ($Na_2O$) A suitable mixture of the two, however, does very well, and such mixtures are commonly used in the Middlesborough and other districts. In a Bessemer converter which has been used for some time blowing ordinary hematite iron, the lining, although worn away in some places, actually increases in thickness in others, large masses of very refractory slag collecting on the sides of the vessel, which it is necessary to chip off at the end of the week when the vessels are cold. This is no exceptional thing, but very common. The analysis of the material used for lining the vessels working on the basic system is as follows:

| | Basic linings. | | Basic linings. |
|---|---|---|---|
| Lime | 49·91 | per cent. | Oxide of iron 3·46 per cent. |
| Magnesia | 30·72 | " | Silica 11·41 " |
| Alumina | 4·50 | " | 100·00 " |

The noticeable feature of this is, that whereas, in the ganister or acid lining, the predominating constituent is silica, in the basic lining there is only 11 per cent of silica, the great bulk of the material being lime and magnesia. Different experimenters have experienced difficulty in using ordinary lime or limestone as refractory lining; but Messrs. Thomas and Gilchrist have succeeded at last in making a basic lining that stands well. There are two or three ways of making good basic linings. The chief one is as follows: Finely-ground magnesian limestone is molded into bricks, which are then calcined in a kiln until all the carbonic acid is expelled, and the substance has shrunk down to about half its original bulk; but they are in this stage ugly, shapeless things, quite unfit for building up a lining, so they are taken to a mill and ground up to a rough powder. This powder is mixed with from 9 to 10 per cent of boiled coal-tar, that is, tar from which the water has been all removed. If any quantity of water remains, the lining is liable to burst, owing to the slacking and consequent expansion of the lime in the composition. This mixture of tar and basic material is thrown in plastic lumps into an annular space, which is formed in the interior of the vessel by the introduction of a cast-iron shell, within which a fire is placed. The basic material, as soon as it becomes hot, melts and naturally fills up the annular space, and becomes quite solid after prolonged heating. Another method is to make bricks of this plastic material in either cast or wrought-iron molds, which, while in their molds, are placed in an oven and baked, when the tar is coked and the material becomes converted into solid bricks. After cooling, the mold is removed, and the bricks of perfect shape are simply built around the inside of the converter without any mortar whatever. When the vessel is ready, molten pig is run in, and the converter being turned up, the blow begins. The following are analyses of the metal charged during the ordinary acidic process:

| | Metal used 15 years ago. | | | Metal used now. | | |
|---|---|---|---|---|---|---|
| Carbon | 3·50 to 4·00 | per cent. | | 3·00 to 4·00 | per cent. | |
| Manganese | ·10 " 1·00 | " | | ·10 " 1·00 | " | |
| Silicon | 2·00 " 3·00 | " | | 2·00 " 3·00 | " | |
| Sulphur | ·01 " ·05 | " | | ·05 " ·15 | " | |
| Phosphorus | ·03 " ·10 | " | | ·03 " ·10 | " | |

Many years ago, only such spiegeleisen as contained between 9 and 10 per cent of manganese was available for Bessemer purposes, and the amount of manganese which it was possible to add without making the steel too hard was limited. Consequently the metal was required to be particularly low in sulphur; for it is a well-known fact that the effect of sulphur upon steel is to make it red-short, so that it breaks when rolling. Manganese has precisely the reverse effect. The quantity of the latter required to neutralize the injurious effect of sulphur is from six to eight times its weight; and the old German spiegeleisen being capable only of adding from ·35 to ·4 per cent of manganese, it is clear that the metal, to work well, should not contain more than ·05 per cent of sulphur. At the present time, however, since the manufacture of better class English spiegeleisen, as much as 20 per cent of manganese is obtained, and, by increasing the proportion of manganese added to the steel, a very much

larger quantity of sulphur is admissible. Hence it possible to make excellent steel now with metal which a few years ago would have been condemned as utterly unsuitable for Bessemer purposes During the blow, the object is to remove from the iron its silicon and its excess of carbon, so as to convert it into malleable steel. If it were possible to arrange matters with ordinary hematite pig-iron so that the exact quantities of carbon and other things could be left in the blown metal, it would be a good thing; but this can not be done, and therefore all the carbon must be blown out first of all, and afterward, by the addition of spiegeleisen, it must be replaced in proper proportion. Thus the first object is to rid the metal of its carbon and silicon, which is performed in from twenty to twenty-five minutes. The following is an approximate table of the decline in the percentage of carbon during the blowing:

| | At the start. | After 5 min. | 10 min. | 15 min. | 20 min. | 25 min. |
|---|---|---|---|---|---|---|
| Carbon..... Per cent... | 3·50 | 3·60 | 3·3 | 3·25 | 2·00 | Trace |
| Silicon.. .... " .. | 2·25 | 1·00 | 0·5 | 0·20 | 0·10 | Trace |
| Manganese.. " .. | 1·00 | 0·35 | 0·2 | Trace | .... | ..... |

Thus it will be seen that the manganese all goes in fifteen minutes; the silicon begins to go immediately, and continues to burn away at about the same rate throughout; while the carbon does not begin to diminish appreciably until all the manganese has gone, and nearly all the silicon. At first, it seems as though the carbon increases, but this is not so; the carbon remains about the same in amount, and, as the quantity of other things diminishes, its proportion to the whole is of course increased. The following is a table similar to the foregoing, showing the action when very siliceous pig-iron is used:

| | At the start. | After 5 min. | 10 min. | 15 min. | 20 min. | 25 min. |
|---|---|---|---|---|---|---|
| Carbon.....(per cent).. | 3·50 | 3·60 | 3·30 | 2·5 | 1·0 | trace |
| Silicon..... " .. | 3·00 | 1·75 | 0·25 | 0·9 | 0·7 | 0·5 |
| Manganese.. " .. | 0·75 | 0·25 | Trace | .... | ... | ... |

Here again it will be seen that the manganese disappears first; the silicon begins at once to go rapidly—so rapidly, indeed, that the very great heat causes the carbon to commence to burn away sooner than usual, and the carbon disappears almost while there is a small percentage of silicon yet remaining. This is what was called a hot-blow; and it is desirable, during a heat of this kind, to add cold material. With such metal as this, the blower is able from previous knowledge to ascertain, a considerable time before the end of the process, that the temperature is going to be excessive, and in such cases he reduces the temperature by the addition of cold scrap or pig metal. When the temperature is not excessive, the silicon entirely disappears before the carbon; consequently the whole of the oxygen entering at the bottom of the bath goes to burn the last traces of carbon, which is therefore very rapidly effected, and the large flame of carbonic oxide at the mouth of the vessel suddenly drops, indicating at once to the blower that the operation is ended. But when silicon is present during the elimination of the last traces of carbon, the flame does not drop so suddenly; for the oxygen is then divided in its action between silicon and carbon; consequently the burning of the last parts of carbon is not so rapid, and the flame, instead of falling suddenly, fades gradually away. When this happens, the blower knows that he has silicon left in the bath, and continues to blow until dense brown fumes appear, which is an indication that the oxygen entering at the tuyeres, after burning all the silicon, is beginning to burn the iron. The sulphur and the phosphorus in the ordinary acidic process are not affected to any extent; they apparently increase; but this is only relative, and is owing to the disappearance of the other ingredients. It will be observed from the foregoing remarks that, as the temperature of the metal increases, the relative attractions of silicon and carbon for oxygen approach each other. At first, when the metal is cool, the whole of the oxygen, practically speaking, is taken up by oxidizing silicon; but after a certain period, when the temperature is considerably increased, the carbon begins to burn along with the silicon, and toward the end of the blow it will be seen, from the analysis of the siliceous blow, that the attraction of carbon for oxygen is as great as or greater than that of silicon. This question of temperature is of the very greatest importance in making steel castings free from blow-holes; for if the carbon has a greater attraction for oxygen than silicon has, the addition of silicon to the bath, for the purpose of producing sound steel, will be of no benefit whatever, and the so-called Terrenoire process of making sound castings must necessarily depend as much upon the correct temperature of the metal as upon the chemical constituents. Mr. Stead strongly advises that very much greater attention be paid to the proper adjustment of temperature at the time of casting, in order that uniformly solid and homogeneous steel may be produced. The following tables show the changes which take place when metal containing about 3 per cent manganese is used:

| | At the start. | After 5 min. | 10 min. | 15 min. | 20 min. | 25 min. |
|---|---|---|---|---|---|---|
| Carbon ..... Per cent. | 3·52 | 3·60 | 3·30 | 2·50 | 1·00 | Trace |
| Manganese..... " | 3·00 | 2·00 | 1·25 | 0·75 | 0·65 | 0·35 |
| Silicon..... " | 1·25 | 0·60 | 0·20 | 0·10 | Trace | ..... |

It will be seen from this that a considerable quantity of manganese remains in the steel at the end of the blow after all the carbon is removed; and in practice, where such metal is used, they can, by the aid of the spectroscope and by taking samples of the slag and metal a few minutes before the perfect elimination of the carbon, ascertain exactly when the proper proportion of carbon remains, at which point the metal is simply poured out of the ladle and cast in the ordinary way, no addition whatever of spiegeleisen being necessary. As manganese in burning gives out a considerable amount of heat, it is not necessary, when it is present, to have more than half the usual quantity of silicon in order to give the heat necessary for the proper conduct of the process.

Mr. Stead, turning his attention to the basic process, gives the following table, showing the composition of the metals commonly used in that process:

METALS FOR BASIC PROCESS.

| | No. 1. | No. 2. |
|---|---|---|
| Carbon..... | 3·35 per cent. | 3·50 per cent. |
| Manganese..... | ·60 " | 1·00 " |
| Silicon..... | 1·30 " | 1·00 " |
| Sulphur..... | ·15 " | ·12 " |
| Phosphorus..... | 1·75 " | 2·75 " |

The special difference between this metal and that which is charged in the ordinary converter is the large percentage of phosphorus; and it is to effect the removal of this element that the basic system was called into existence. When the metal is charged into the vessel, from 15 to 17 per cent of well-burned lime is also put in, for the purpose of absorbing the silica and phosphoric acid produced by the oxidation of silicon and phosphorus, which, if no lime were present, would assert themselves by eating away the lining of the converter, which would in such a case be rapidly destroyed. The following table gives the approximate rates at which the various substances disappear from phosphoric pig-iron during the blow:

| | At the start. | After 5 min. | 10 min. | 15 min. | 18 min. |
|---|---|---|---|---|---|
| Carbon . . . . Per cent. | 3·50 | 3·55 | 2·35 | 0·07 | Trace |
| Silicon.... ..... " | 1·50 | 0·50 | 0·09 | Trace | ..... |
| Manganese.. ..... " | 0·71 | 0·56 | 0·27 | 0·12 | Trace |
| Phosphorus..... " | 1·57 | 1·60 | 1·43 | 1·22 | 0·08 |
| Sulphur... ... ... " | 0·16 | 0·14 | 0.13 | 0·12 | 0·10 |

From this it will be seen that, as in the ordinary acid process, the carbon at first increases slightly, and afterward rapidly burns away, while the silicon is speedily eliminated during the first few minutes of the blow. The manganese also is burnt out before the end of the operation, but not quite as rapidly as in the acid-lined vessel. Practically, no phosphorus is eliminated until the whole of the carbon has been removed. The reactions which really take place in the basic process have been very carefully and systematically investigated, and are of great interest to those concerned in the chemistry of the process. The Bessemer converter had always been classed as a great oxidizing apparatus, and, looking at it as a whole, it is so; but it would be quite as logical to state that the blast-furnace, which all consider to be a reducing machine, is also an oxidizing apparatus. The fact is, that both are oxidizing and reducing. In the blast-furnace, the oxygen entering in at the tuyeres oxidizes the carbon in the coke, producing heat; but in the higher reaches of the furnace, the gases so formed, and the unoxidized carbon, are very powerful reducing agents, and effect perfect reduction of the iron ore charged. In the Bessemer converter, there is also a lower or oxidizing part and an upper reducing region. At the lower part, near the tuyeres, the oxygen rapidly enters into combination, not, as some would suppose, with the elements exactly as in the order shown in the ultimate analytical tables, but with the whole of the constituents all together, in the proportion in which they are present, producing a very highly basic oxide of iron cinder. This cinder, passing upward through the column of metal, which, owing to the rushing of air through it, is in violent agitation, reacts upon the silicon and manganese, and at the same time also upon phosphorus, producing silicate of iron, silicate of manganese, and phosphate of iron. As the cinder is more and more intimately brought into contact with fresh portions of metal, the greater part of the oxide of iron is reduced, the iron returning to the bath at the same time that the silicon and manganese are oxidized. These reactions may very briefly be described by means of chemical symbols, thus:

1. $Air+Fe_n = FeO_n+N$
2. $2FeO+Si = SiO_2+Fe_2$
3. $FeO+Mn = MnO+Fe$
4. $6FeO+2P = FeO,P_2O_5+5Fe$
5. $FeO,P_2O_5+6C = Fe+P_2+6CO$
6. $FeO,P_2O^{'}+3Si = 3SiO_2+P_2+Fe$

It will be seen from the last two reactions, Nos. 5 and 6, that, as long as carbon and silicon are in the bath, there being a large head of metal over the tuyeres, practically no phosphorus can be eliminated. If, however, the bath were shallow, or the tuyeres were caused to inject air forcibly upon the surface of the metal, there being on the surface at the same time a quantity of lime, ready to absorb any silicic or phosphoric acid produced, the phosphorus might be and has been perfectly removed before the elimination of the carbon. Thus, at the Blaenavon Works, where Messrs. Thomas and Gilchrist made their first experiments in a stationary converter in which the tuyeres were certainly not more than a few inches from the surface of the metal, in almost every case the whole, or at least a very great proportion, of the phosphorus was eliminated by the time that the last portions of carbon were removed from the bath. The question might be asked, why the oxide of iron produced by surface oxidation is not reduced, remembering that the metal during the blowing process must necessarily be in a violent state of agitation, and therefore brought into intimate contact with the cinder formed at the surface. The explanation is very simple. When the phosphate of iron is formed at the top of the bath, it instantly afterward comes in contact with the highly-heated lime, which completely decomposes it, phosphate of iron and lime reacting on each other and forming phosphate of lime and free oxide of iron, and this phosphate of lime is incapable of reduction by the carbon in iron or by carbonic oxide gas. Hence no reduction takes place. From the point of the termination of blowing forward, the operations in the acid and basic processes are similar; only in the case of basic steel, the greater part of the surplus oxygen contained in the bath is removed by Mr. E. W. Richards's process of adding fluid hematite pig-iron containing silicon. To the blown metal is added spiegeleisen, by means of which the necessary carbon and manganese are put back into the metal (and by means of which, in the case of acidic steel, the surplus oxygen is also removed), which is thereby converted into malleable steel. The following are analyses of spiegeleisen:

| | Old German. | New English. |
|---|---|---|
| Carbon..... | 4·50 per cent. | 5·20 per cent. |
| Manganese..... | 10·00 " | 20·00 " |
| Silicon..... | ·50 " | ·50 " |
| Sulphur..... | Trace | Trace |
| Phosphorus... | ·10 " | ·10 " |

The reason why phosphorus can not be removed in the ordinary silica or acid converter is made perfectly clear by the following equations:

$$3CaO,P_2O_5+3SiO_2 = 3CaO,SiO_2+P_2O_5$$
$$FeO,P_2O_5+SiO_2 = FeO,SiO_2+P_2O_5$$
$$P_2O_5+5Fe = 5FeO+P_2$$

These reactions show that phosphate of iron or lime, if found in the presence of silica, is decomposed, silicate of iron or lime being formed, and free phosphoric acid being produced. But this free phosphoric acid can not exist as such, but is reduced, not only by the carbon and silicon, but even by the metallic iron itself. If a rod of pure iron is simply dipped in phos

phoric acid, and heated to redness while in contact with it, a fusible drop of phosphide of iron forms at the extremity of the rod. Comparative analyses of the slags produced in the two processes are as follows:

| | Ordinary slag. | Basic slag. |
|---|---|---|
| Protoxide of iron (FeO) | 15·62 per cent. | 9·13 per cent. |
| Peroxide " ($Fe_2O_3$) | 1·57 " | .... " |
| Metallic iron (Fe) | .... " | .... " |
| Alumina ($Al_2O_3$) | 1·02 " | 2·10 " |
| Oxide of manganese (MnO) | 5·33 " | 4·32 " |
| Silica ($SiO_2$) | 75·70 " | 16·60 " |
| Lime (CaO) | 0·94 " | 47·08 " |
| Oxide of magnesia) MgO) | 0·09 " | 4·62 " |
| Sulphur (S) | 0·01 " | 0·12 " |
| Phosphoric Acid ($P_2O_5$) | Nil. " | 16·03 " |
| Bases | 14·57 per cent. | 65·15 per cent. |
| Acids | 75·71 " | 34·85 " |

A very great proportion of the present waste is due to projections from the nose of the vessel, which is liable to be carried away with the rubbish of the Bessemer house. An analysis of an accumulated mass of such projections yielded the following:

BESSEMER PROJECTIONS.

| | Per cent. |
|---|---|
| Free iron (Fe) | 70·30 |
| Peroxide of iron ($Fe_2O_3$) | 14·50 |
| Manganese (Mn) | 0·11 |
| Carbon | 1·01 |
| Silicon | 0·63 |
| Sand | 13·18 |
| Phosphorus | 0·05 |
| Sulphur | 0·06 |

According to careful analytical data, not more than 2 per cent of the metallic iron in the charge is actually burnt. If no loss occurs either in projections, scrap, or iron mechanically carried away entangled in the slag, the yield of steel should be 92·5 per cent of the metal charged. In practice, however, the yield averages from 3 to 4 per cent less than this. In the basic converter, the theoretical yield is about 2 per cent less than from the ordinary vessel; but in practice, owing to the large amount of slag produced, more particles of metallic iron are liable to be carried away with the slag, so that a yield of 85 per cent is considered very satisfactory. The comparative composition of basic steel and ordinary acidic steel is shown by the following analyses:

| | Acid. | Basic. |
|---|---|---|
| Iron | 98·33 per cent. | 98·46 per cent. |
| Carbon | 0·35 " | 0.35 " |
| Manganese | 1·11 " | 1·01 " |
| Silicon | 0·08 " | 0·03 " |
| Sulphur | 0·06 " | 0·11 " |
| Phosphorus | 0·05 " | 0·04 " |
| Copper | 0.02 " | Trace |

From these it will be seen that the steel produced is very similar in both cases. The basic process is making rapid progress in a commercial sense, not so much in England (although there are several new works arranging for the process near completion) as on the continent. Mr. Gilchrist, one of the patentees, has recently estimated that the make of that steel last year every where was about half a million tons, and that the make of the forthcoming year will probably be double that quantity.

## SOME CAUSES OF RED-SHORTNESS AND COLD-SHORTNESS IN IRON.*

By William Metcalf.

I do not propose to discuss the well-known red-shortness and cold-shortness of iron caused by sulphur and phosphorus respectively, nor the well-known effect of oxygen in producing red-shortness in steel. In fact, the latter is not altogether proved. For instance, in walking through an establishment with my partner, where some large steel ingots were worked, we noticed that the ingots were unevenly heated in a sharp oxidizing flame, and the corners were cracking badly and being chipped in every ingot. Upon calling attention to the matter, one of the gentlemen in charge replied, "Oh! that is not burnt; that's sulphur." As the gentleman had been in the business several months, we meekly closed our mouths. On the contrary, Mr. Park, who has been noted as a steel-maker for more than twenty years, charged all of the evils in steel to "wind," during a discussion before this society.

For the purpose of provoking a discussion, I have prepared a table, of analyses, showing some odd results. After explaining the table, I hope the members will explain the results.

| | Siemens Direct. | | Dupuy Direct. | United States Series. | | Lucy. | | Titan. | |
|---|---|---|---|---|---|---|---|---|---|
| | Iron. | Steel. | | Mn. | Phos. | Pig. | Muck | Pig. | Bar. |
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
| Silicon | ·038 | ·004 | ·460 | .... | ·048 | ·790 | ·142 | 2·170 | ·081 |
| Phosphorus | trace | ·011 | ·010 | ... | ·435 | ·090 | ·032 | ·054 | trace |
| Sulphur | ·046 | ·016 | ·027 | .... | ·002 | ·038 | ·003 | ·008 | ·015 |
| Manganese | ·000 | ·000 | .... | ·694 | ·019 | .... | .... | .... | .... |
| Copper | ·030 | ·020 | ... | .... | ·003 | .... | .... | ·000 | ·010 |
| | | Estimate | | | | | | | |
| Carbon | ·033 | ·300 | .... | 2·36 | ·312 | .... | .... | .... | .... |
| Dissolved oxide | ·300 | . .... | | .... | .. .. | .... | .... | .... | .... |
| Oxides or cinder | ..... | ..... | ·796 | .... | .... | .... | ·113 | .... | .... |
| | 38,556 | 87,400 | .... | Tried for Mn. 1·5 Carbon low. | Tried for P. ·5 Carbon low. | | | | |
| Tensile strength | 40,824 | ..... | .... | | | | | | |

No. 1 is an analysis of some Siemens direct iron, made at the Black Diamond Steel-Works. The two tensiles given were obtained, the first from the iron once hammered and rolled, the second from the iron twice hammered and rolled. This iron was excessively red-short.

No. 2 is steel made from No. 1 with no addition to the iron except a little manganese, and whatever carbon the pot may have given it. This steel was not at all red-short; and you will observe, by the tenacity, that it was not cold-short.

No. 3 is some Dupuy direct iron. This was excessively red-short. Steel made from this iron of about ·90 carbon, was not only not red-short, but it was remarkably strong and fine—the record says, quite equal to Jessup's Best and Black Diamond, which we happened to be criticising about that time.

Nos. 4 and 5 are steels made for the United States Test Board.

No. 4 was an effort to produce a manganese steel containing 1·5 per cent of Mn and carbon very low. You see how well we succeeded. This steel was very hot-short, and very cold-short, and not at all red-short. This proves that the Bessemer men are all right when they go in for manganese and lively rail-rolling.

No. 5 was one of a phosphorus series we tried to make. In this case, we aimed at P ·500 and C low. We were not so wide of the mark this time. This steel hammered well at a good heat.

A piece 1¼×¼ inches could not be hardened, and although little flakes could be knocked off easily with a hand-hammer, the whole bar would bend cold to a right angle before fracture. It was not hot-short, nor cold-short to excess, notwithstanding an amount of phosphorus that, to say the least of it, was large.

No. 6 is Lucy Bessemer pig, and No. 7 is the resulting muck iron. These analyses will bear close inspection for their good qualities, and yet No. 7 was the most extremely red-short bar of iron I ever saw. It was for that reason that it was analyzed. As 2 per cent of cinder and from ·023 to ·025 of sulphur are quite common in good neutral muck iron, this is the case of red-shortness I wish to have explained. No. 8 is Titan charcoal pig, and No. 9 is the resulting muck iron rolled down to 2½×½. This muck iron was very clean, granular, and highly lustrous in the fracture. It worked perfectly under the hammer, from welding to red heat. It looked hard, and I first thought it was a sort of puddled steel; but it proved to be dead soft; the more it was heated almost white and quenched, the softer it seemed to be. This bar was so cold-short that a piece a few inches long could be held in the fingers and crumbled to pieces on the anvil by light blows of a hand-hammer. It was for this reason that it was analyzed, in a search for the cause of the cold-shortness.

*Paper read before the Engineers' Society of Western Pennsylvania, March 16th, 1883.

## PROGRESS IN SCIENCE AND THE ARTS.

**An Electric Thermometer.**—M. Becquerel has been engaged during the winter in experiments, the object of which was to ascertain whether snow had the effect of protecting the ground from frost. In carrying out these experiments, he pressed electricity into his service in a most ingenious manner. Before describing his apparatus, we may, however, state that the result of his experiments was as follows: That a covering of snow does not protect the soil and seed from freezing, but only hinders to a certain degree the too extensive radiation of heat from the soil, and is converted into water at 32 degrees, which sinks into the earth and somewhat raises its temperature. Also, that a heavy sod does more to protect the soil and raise its temperature than ever so thick a layer of snow. The experiments were carried out in the Jardin des Plantes, Paris, and in the following manner: Two covered wires of unlike metals—copper and iron—were soldered together at both ends, which were left uncovered for this purpose; otherwise they were covered their whole length, for the purpose of insulation, with gutta-percha and silk. On the soldered ends of these double wires being exposed to different temperatures, a current is generated in them, and the greater the difference in temperatures, the stronger the current; but the current ceases when both are exposed to the same temperature. This electric current was caused to act on a magnetic needle suspended so as to move freely over a graduated circle. The copper wire formed a vertical frame around the needle parallel to its normal direction. As long as both ends of the double wire are at the same temperature, the needle continues to point to the north, being subject only to the earth's magnetism; but as soon as there is any variation in temperature, the needle is sure to move instantly and take another position, which it will keep until some other change of temperature takes place. The application of this apparatus to the measurement of soil temperatures was made as follows: One of the soldered joints was buried in the earth to a depth at which it was desired to take the temperature, and the other end was put in a water-bath at any desired distance from the first. The temperature of the latter could be increased or diminished at pleasure, and was measured by a very sensitive thermometer. To ascertain the temperature in the soil where the other end was buried, is was only necessary to raise or lower the temperature of the water-bath until the magnetic needle stood at zero, and then read the thermometer.

### FURNACE, MILL, AND FACTORY.

The Lancaster Manufacturing Company has been organized under the laws of the State of New York, with a capital stock of $250,000. The officers of the company are: James H. Lancaster, President; John Pickering, Treasurer and John Q. Maynard, Secretary. The facilities for manufacturing the Lancaster tools will now be considerably increased. The company has acquired the sole right to manufacture and sell in the United States and Canada the patented inventions of James H. Lancaster, consisting of stocks, dies, and adjustable pipe-guides; twin pipe-cutters with burr-scrapers; combined pipe and nut-wrench; combined pipe-cutter, wrench, and burr-scraper; combined punch, shear, wire-cutter, and anvil; pipe inside burr-reamers. Other improved tools will be added to this list from time to time.

The Hartman Steel Company, of Beaver Falls, Pa., has started a portion of the machinery in its new wire mill, and, according to present accounts, it is working very satisfactorily. The company has just placed contracts for its merchant steel and rod trains.

A new rolling-mill is in course of construction at Toledo, Ohio, by a company known as the Maumee Rolling-Mill Company, with $500,000 capital. H. S. Walbridge is President; I. Droege, Vice-President and General Manager; H. S. Worthington, Treasurer; E. H. Van Hoesen, Secretary. It expects to be in operation by the end of the year.

Forty rollers and heaters employed in the pudding-mill of the E. & G. Brooke Iron Company, at Birdsboro', have stopped work on account of a reduction in their wages ranging from 11 to 12½ per cent.

The St. Louis Ore and Steel Company, owner of the Vulcan Iron-Works, has taught the members in that city of the Amalgamated Association of Iron and Steel Workers a lesson. The result of it all will be the dissolution of the latter, as far as St. Louis is concerned. When the Vulcan, some time ago, announced a

reduction of wages to these high-priced workmen, but not to others, they promptly struck and quit work. The company put new men on, and after a little time taught them their work. The company will not now employ union men on any terms.

It is expected that, at the meeting of stockholders of the Union Iron and Steel Company on April 14th, the announcement will be made that sufficient capital has been obtained to enable the company to reopen the mills. A creditors' meeting will be called soon after the stockholders' meeting, and those most interested believe that at that time the difficulties will all be settled. It is known that the company has a very large stock of pig-iron and ore on hand ; that the works are in excellent condition ; and that there are contracts holding good for a heavy output of rails.

The rebuilding of the Grasshopper mill at Youngstown, Ohio, and erection of all the machinery, have been completed, and it is running full time. With their mill, the Arms, Bell & Co. have more than sufficient capacity to roll the iron needed to supply all the nut and bolt machines operated by the company in both its establishments.

The Coosa Furnace Company has begun operations at Gadsden, Ala., on the Coosa River, and is building a 12-foot furnace. It is equipped with iron stoves, and is now about completed. This is an old furnace, that has been moved here from Terre Haute, Indiana. The intention is to use charcoal, but the furnace will first be put in blast with coke, which will be procured on the line of the Cincinnati Southern Railroad.

The Vesta Furnace, near Marietta, Lancaster County, Pa., owned and operated by Watts, Twells & Co. Limited, has had a most exceptionally good blast since December, 1881, when it was blown in; not a day's yield of iron has been lost, and it has turned out regularly nearly 1000 tons per month, not ten tons of which were under grade of No. 3. This furnace has now a most enviable reputation for the superior quality of the iron, both for mill and foundry use. Henry M. Watts & Son are making arrangements to put their Marietta furnace No. 1 in blast.

A sale has been closed for one of the heaviest rock-breakers ever built. It was a Buchanan, weighing 60,000 pounds, and was bought by the Park Commissioners.

Messrs. John A. Roebling, Sons & Co., recently sent from Trenton, N. J., to San Francisco, a wire rope, 1½ inches in diameter and over four miles long. It is for a cable street railroad in San Francisco, and it is asserted that it is the longest and heaviest rope wire ever made in the United States. The rope weighed about twenty-five tons, and was loaded on two flat cars, secured together by chains, in addition to the usual coupling.

The Cummer Engine Company, Cleveland, Ohio, is now fairly under way in all departments, and its present capacity is crowded to its fullest extent to fill the orders. The company employs about 175 men, and will gradually increase its force to 300 men, the full capacity of its present plant. The factory, when completed and equipped, will consist of two molding-rooms, 300 by 80 feet, and a machine-shop 400 by 60 feet, two stories. Altogether the buildings and grounds will be 400 by 350 feet, and accommodate 500 workmen.

There is a strike among the puddlers and helpers at the Pencoyd Iron-Works, West Manayunk, Pa., owing to the attempt of the company to reduce the scale of wages from $4.25 per ton to $3.75.

At Shawnee, Ohio, the New York is doing nothing, and the XX is doing next to nothing. The Mauley is loading from four to six cars a day. The Shawnee Coal and Iron Company has shipped 8000 tons more coal during the past three months than during the corresponding period of 1882. The Fanny furnace has been operating one stack very successfully since the February rains, which supplied the needed water.

The Columbus & Hocking Coal and Iron Company, at Columbus, Ohio, with its fifteen mines, seven furnaces, and ten stores, is just closing the first month's operations under the new *régime*. Only three of the furnaces have been in operation ; but these are now very busy in filling the company's orders. The coal trade has of course been light ; but Mr. Longstreth, who has charge of the coal department, and Mr. Crafts, the superintendent of the iron department, are each looking into and systematizing the details of their respective departments, in order to be in good shape for business when the lake season opens.

The Hercules Iron-Works, of Chicago, have just shipped to the Streator, Ill., coal mines two of the Murphy Champion ventilators.

The Chicago Rawhide Manufacturing Company's goods are becoming widely known. On the 14th of March, it shipped a large invoice of its rawhide leather belting to Sydney, Australia.

## MINERAL PATENTS GRANTED BY THE UNITED STATES LAND-OFFICE.

The following patents were issued by the General Land-Office under date of April 1st, 1883 :

### ARIZONA.

TUCSON DISTRICT.

Marshall Blinn, Shorty and Ecstasy lodes.

### CALIFORNIA.

HUMBOLDT DISTRICT.

Stone Lagoon Gold Mining Company, placer.

MARYSVILLE DISTRICT.

John Stokes, placer. Isaac W. Kitchen, Carlton placer. William Hooper, Sand Bluff gravel placer.

SACRAMENTO DISTRICT.

George E. Williams, Long quartz mines. James O. Groves, Groves gold quartz mine. Philip Molter, Mammoth placer. S. C. Farnham, Farnham gold quartz mine.

SAN FRANCISCO DISTRICT.

Samuel Schwartz, El Devisadero lode. Nathan Goldtree, El Salto mine.

STOCKTON DISTRICT.

William H. Guion, Bonita quartz mine and mill-site.

SUSANVILLE DISTRICT.

G. W. Meylert *et al.*, Nigger Gulch placer mine.

### COLORADO.

CENTRAL CITY DISTRICT.

S. E. Gordon, Keystone lode. Michael J. McKinley *et al.*, Little Max lode. William Linsley, Next President lode. George W. Cox *et al.*, Bismarck lode. Cascade Mining and Development Mining Company, Prussian lode. Dennis Faiore *et al.*, Calvin lode. George W. Cox *et al.*, Cataract lode. Cascade Mining and Development Company, Magna lode. Consolidated Mining and Development Company, Comanche lode.

DURANGO DISTRICT.

C. H. Byfield *et al.*, Franklin lode. George U. Ingersoll *et al.*, Dives lode.

LAKE CITY DISTRICT.

John L. Kinsey *et al.*, Mountain View lode. Philip N. Nicholas, Lulu lode. James F. Steinbeck *et al.*, Fannie lode.

LEADVILLE DISTRICT.

Oliver C. Obey *et al.*, Sierra Nevada lode. Stephen H. Pease *et al.*, Little Earl and What Is It lodes. Ephraim C. Gilman *et al.*, New York lode. Liverpool Gold and Silver Mining Company, Centennial lode. C. W. Baker, Flume lode. Colorado Consolidated Mining Company, Oriental and Rattler lodes. Silver Cord Combination Mining Company, Silver Cord and Eagle lodes. S. W. Miller, Victory lode. Ballarat Mining Company, Tip Top and Ballarat lodes. Dyer Mining Company, Dyer and Hawthorne lodes. Gilbert W. Packer, Pacific lode. Charles T. Limberg *et al.*, Mystic lode. Robert J. Coleman *et al.*, Warrior and Rams lodes. Charles B. Farwell (trustee), Mineral Fame lode. A. C. Spencer, Bonanza King lode. Coal patent for Strong P. Johnson.

PUEBLO DISTRICT.

George P. Gould *et al.*, Elematah lode. James H. Kerr, Little Horn lode. Wet Mountain Mining Company, North half of the Silver Cliff lode. Consolidated Mining Company of Seven Mines, Black Cloud, Dover, and Donnelly lodes.

### MONTANA.

HELENA DISTRICT.

William Chumrasero *et al.*, Hamlet lode. Anthony H. Hedley *et al.*, Adirondack lode. James A. Talbott *et al.*, Broker lode. George H. Long *et al.*, Tecumseh lode.

### NEVADA.

EUREKA DISTRICT.

A. McMahon *et al.*, Magnolia lode. A. L. Fitzgerald, Don Ricardo lode and mill-site.

### OREGON.

LE GRAND DISTRICT.

James P. Faull, Faull quartz mine.

### UTAH.

SALT LAKE DISTRICT.

William H. Menerary *et al.*, Brooklyn lode. John J. Daly, Winooka lode. Frederick Auerbach, Sentinel lode. Apex Mining Company, Brave Columbia, Monroe Doctrine, Constitution, Cumberland and Hanna lodes. Joseph Pugsley, coal. Philip Pugsley, Jr., coal. Richard A. Margett, coal. Joseph S. Barlow, coal.

## GENERAL MINING NEWS.

### ARIZONA.

COCHISE COUNTY—TOMBSTONE DISTRICT.

Lima Consolidated.—This company owns three locations, the Green Cloud, the Lima, and a fragment called the Old Necomis. Considerable work has been done on the two former claims. The shaft has attained a depth of 265 feet, and is sunk on the ledge. This ledge has the very same direction as the Grand Central and Contention mines, nearly north and south. Four levels have been started, at 85, 135, 190, and 250 feet, from each of which drifts have been run in on the ledge, that on the 135-foot level being run 60 feet north and the same distance south. The ledge from the surface down shows good and strong, and, as depth is attained, widens out, until, at the 250-foot level, it is five feet in width. From the bottom of the shaft, ore was hoisted, and from the north drift, 250-foot level. The ore, which is mixed with a good percentage of manganese, contains chloride and horn-silver, and a fair average of the ledge may be put at $35, while with a little sorting, an average of $80 is obtained.

GRAHAM COUNTY.

Copper King.—This company owns five claims, which are named Union No. 1, Union No. 2, New England, Montezuma, and Arizona Boy. Union No. 2 has had considerable work done on it. An open cut 68 feet long and 30 feet deep has been made on the vein. The ore is copper glance, and gives good assays. Six hundred tons of ore are now on the dump, taken from this cut. This claim has also a tunnel 30 feet long, showing good indications. But little work has been done on the other claims except on the New England. On that, a shaft has been sunk near the vein 40 feet, which will drift to the vein. About two tons of high-grade ore, carrying considerable native copper, were taken from the surface. The vein is from 25 to 30 feet in width, and is considered the mother lode. These properties are about two miles from Oro, and five miles from Clifton in a northerly direction. A force of men will soon be put to work to develop them. The vein on which Nos. 1 and 2 are situated has claims located on it 23,000 feet.

### CALIFORNIA.

CALAVERAS COUNTY.

Hoosier Consolidated.—The Calaveras *Chronicle* states that this company own the Mary Lory, the Way Ground, and the Hoosier. Four tunnels have been run at intervals along the course of the lead, besides prospecting-shafts, in all of which were found good rock and the indications of the existence of a true fissure-vein. The rock from three of the tunnels which were run several years since, was conveyed with great difficulty and expense a long distance to the river below, where it was worked by the arrastra process. Prior to the erection of the mill, the rock on the old dump was thoroughly prospected, with a view of getting as nearly as possible a correct estimate of the value of the rock. According to the results, the estimate was placed at the lowest—$5 per ton. The rock was not selected, but taken just as it came from various parts of the dump. With this estimate, it was calculated that the rock in sight, which is in quantities to last several years of milling, could be worked with a fair compensation, together with very flattering prospects in the development of the mine. A tramway 113 rods in length, with a grade of one foot to the rod, was constructed, reaching from the Hoosier tunnel to a point above the mill, by which it is connected with another tramway, 300 feet in length, directly down the hillside, which slopes at an angle of about 45 degrees. The first run of 75 tons of the ore from the old dumps exceeded the estimate made, and yielded $7 per ton. The indications are, that the present run will equal if not exceed that figure. The cost of milling the rock does not exceed $2.50 per ton. But ten stamps have been put up for the present, but the frame-work was constructed so as to permit the addition of ten stamps more. The mill is run by a hurdy-gurdy water-wheel, the necessary pressure being easily obtained by a ditch tapping the Calaveras River a comparatively short distance above, and supplying free water for running and all other mill purposes.

MONO COUNTY—BODIE DISTRICT.

Bodie Consolidated.—The official report for the week ended March 24th shows : Tons of ore crushed, 156·78 ; average assay value of pulp, $36.54 per ton ; of tailings, $4.32. East cross-cut, 1000 level, was driven 12 feet. The flow of water has lessened a little, so that the pumps are running at the rate of about 7¾ strokes a minute. The north drift, 800 level, is 307 feet long. South drift, 770 level, is 73 feet long. From the north drift, 700 level, a rise, No. 22, has been made on the Fortuna, and this is now 37 feet long, as measured on the dip of the vein. The north drift from winze No. 6, 672 level, is now in 40 feet.

Bulwer Consolidated.—The west cross-cut from the north drift, 700-foot level, has been advanced during the week 11 feet ; total length, 115 feet. The face is still in hard blasting ground.

Standard Consolidated.—The official report for the week ended March 24th shows : Tons of ore shipped to mills, 1291. West cross-cut, 1000 level, is in 1285 feet. South drift, from east cross-cut, 700 level, is in 592 feet, and shows 2⅓ feet of vein. West cross-cut from south drift is 115 feet long, and is in hard blasting rock. North drift No. 1, 500 level, is in 588 feet, where the vein is about 12 feet wide. North drift from south uprise No. 1 is 111 feet long, and the vein

is 6 feet wide. South drift No. 2, 385 level, is in 379 feet, and shows the vein 6 feet wide. The stopes are looking well.

SAN BERNARDINO COUNTY—PROVIDENCE DISTRICT.

Rich discoveries have been recently made, and the prospects promise a most prosperous future for this district.

BONANZA KING.—The reports from this mine continue to be favorable.

TROJAN.—Work has been begun on this mine, an adjoining property of the Bonanza King.

## CANADA.

PROVINCE OF MANITOBA.

The Winnipeg *Mining Index* reports as follows :

BRITISH AMERICAN.—This company has recently been organized to carry on operations in Keewatin District. The capital stock is $500,000, divided into 50,000 shares of $10 each. The company will develop a location situated about a mile and a half from Rosslyn station and eleven miles from Rat Portage. The vein is a strong one, carrying a reddish quartz showing copper and iron pyrites. The surface yield is fair. Nothing much will be done at present beyond getting out timber and erecting buildings ; but when the snow leaves, sinking will begin.

KEEWATIN.—A rich body of ore was recently struck. Work has been going on steadily.

LAKE WINNIPEG.—This company is working a location near Big Island, on the east shore of the lake, with very promising results. The vein is a large one, and assays very well in both gold and silver. The shaft has attained a depth of twenty-five feet.

SASKATCHEWAN.—This company was formed to dredge for and wash the auriferous sands of the river Saskatchewan. It has not been able to begin operations yet on account of the ice; but the company has purchased the necessary machinery, and every thing is in readiness to start as soon as the river is clear. Dredging and sluicing were tried unsuccessfully some little time ago, although the failure was more on account of having very primitive machinery than a lack of the precious metal, as, during the one day in which the machine did work, about $84 worth of gold was saved at very little expense.

WINNIPEG CONSOLIDATED.—The vein has been increased by another feeder from the hanging-wall, and the bottom of the shaft looks well. Over 200 tons of quartz are on the dump ready for milling, and work on the mill is pushed vigorously.

## COLORADO.

CLEAR CREEK COUNTY.

A dispatch from Idaho Springs to the Denver *Republican* says that large blocks of copper ore, carrying native copper, have been discovered near the Old Chief, on Soda Creek.

PAY ROCK.—It is expected that the new concentrator will start by the middle of April.

POLAR STAR.—The water that heretofore proved so troublesome is under control. An engine and pump to clean the 128-foot shaft from the lower level are fitting up. The 65-foot shaft at the mouth of this level is going down steadily under the contract with J. Thomas & Co. A drift east has been started sixty feet down.

SEVEN-THIRTY.—The mineral continues of good quality in the 310-foot level west. Six tons milled assayed 125, 135, and 350 ounces per ton according to class, the whole lot averaging $147.83 per ton. The breast of the 310-foot level east shows three feet of solid mineral. The main shaft is sinking day and night, and is down about 60 feet below the 310-foot level. The mineral continues in it all the way down, and is apparently improving in quality. The last run from No. 2 west brought 334 ounces per ton.

DOLORES COUNTY.

Mr. Linwood O. Towne, of Rico, under date of March 28th, sends us the following notes :

GARFIELD.—In this mine, situated up Horse Gulch, a most encouraging strike of fine gold-bearing quartz has just been made. Work has been steadily going on at this property all winter. There is a well-defined vein from which come specimens assaying as high as 152 ounces in gold, with some silver.

NEWMAN GROUP.—Work is rapidly pushed by the leaser, Mr. Frederick Reed. Some of the richest ore ever taken from the group, showing wire silver, has recently been obtained in quantity from the Swansea, and shipped to the Grand View smelter.

GRAND COUNTY.

PIONEER.—Some excitement was occasioned the other day by a rich strike in the Toponis mine, the property of this company. From eighteen inches to two feet of mineral were uncovered, and the ore has every appearance of being high-grade, carrying gray and yellow copper and a very fine galena. Six men are steadily employed at the mine, and the pay-streak continues to increase in width.

WOLVERINE.—The company has decided to build at the Gaskill mine.

GUNNISON COUNTY.

NATIVE SILVER NO. 2.—A strike of Ruby and brittle silver was made in this lode, near what is called Mineral Ranch, four miles from camp. The vein is several feet wide, and has a streak of ore which will run from 1000 ounces up. The ore, on being roasted, is literally covered with globules of silver. The vein is in the solid formation.

SILENT FRIEND.—In the north drift of the ninety-foot level of the mine, a cave was opened which proved to be 225 feet deep and from three to fifteen feet wide. It has been explored, and its walls are found to be all mineral galena and lead carbonates, and it is estimated there is $50,000 worth of ore lying loose at the bottom, which has fallen from the sides and roof. The company will immediately arrange to hoist the loose boulders, which are mostly carbonates.

TERRIBLE.—This mine has been sold to J. S. Lawrence, of the Gunnison First National Bank, for $30,000 cash.

HINSDALE COUNTY.

CROOKE'S SMELTING-WORKS.—The works have not been making full time lately, owing in part to short water supply, and in part to the fact that little or no stoping has been done at the mine, the concentrator chiefly treating the dumps, which do not yield sufficient to supply the roasters. The seventh level of the Ulé mine, which is the property of this company, is running northeast and southwest from No. 2 shaft, and is about 25 feet on each side. Winzes are sinking which show about the usual body and character of ore. Stoping is also going on in the Ute, but no new ground has been opened as yet. The company is considering the subject of putting up an elevated tramway, to run the ore from the mine to the concentrator. We are informed that the announcement that contracts have been let and tram ordered is premature, although there is little doubt that the directors will favorably consider the matter.

LAKE COUNTY.

Late Leadville exchanges contain the following :

BROOKLAND.—Work has been resumed on this property after putting in a new plant of machinery. The work of development will be pushed and shipments begun shortly.

CHRYSOLITE.—The new sampling-works will be in operation shortly. In the mean time, the mine is worked unobtrusively, but with a generally satisfactory result. Four leases are running on various parts of the property. First, the Marden lease, which covers the burnt district in the old Carboniferous, Chrysolite, and Vulture claims. This lease, without proving an absolute bonanza, has paid very fairly. The lessees have shipped nearly an average of 90 tons a week, by gleaning where the miners had gone before them, and must have realized several hundred dollars each a month. Secondly, the Ayres lease, which includes the old workings on the Muldoon, and parts of the Pandora and Vulture. These lessees have as yet shipped no ore. Thirdly, the Webb lease, which is on part of the Vulture, and the old Eaton workings. The lessees have been very fortunate. They have shipped about 50 tons of ore per week, and must have realized several thousand dollars. Fourthly, the Church lease, which is on the Colorado Chief No. 1, and the edge of the Pandora. The lessees have as yet shipped no ore, although they have a considerable quantity in the ore-bins. From these four leases, the company is realizing about $5000 a month. Two of them run out in October, and the other two in February next. Simultaneously, Manager Clark is doing a little mining on company account, which nets enough to pay the current expenses of the mine, including the cost of driving the new incline on Colorado Chief No. 2—say $11,000 a month. The prospects of the company depend largely on the completion of this incline.

LITTLE ELLEN.—This mine, the property of the American Smelting Company, is steadily worked. The property is developed by an incline, which has reached a depth of 750 feet. The company intends to put a new plant of machinery on this incline, and has ordered a large double hoister, engine, and boiler. The property is doing well, and the new strike which is reported to have been made in the adjoining Trade Dollar, which belongs to the company, will add materially to its value.

MIKE & STARR.—Work has been started up, and sinking is vigorously prosecuted. A winze forty feet in depth has been sunk in the main level, from which a cross-cut is run thirty-five feet—striking a body of mineral seven feet in thickness. The ore, as in the past, is refractory, but sample assays have been made which returned from sixty to seventy ounces silver and from fifteen to twenty per cent copper. A three-inch drill is worked in the bottom of the main shaft, and is sinking at the rate of eight feet per day. It has passed through twenty feet of white quartz, and is still in the same matter.

NEW PITTSBURG.—During the past month, the territory in the neighborhood of the Lent shaft has been developed, and with very gratifying results. From this shaft, a drift has been run in a northwesterly direction about eighty feet. From about this point, a drift has been run a short distance to the north, developing three feet of good ore. In a west drift from near the same point, two feet of ore have also been opened up. About a foot of ore has also been shown up in a drift almost due north from the shaft. The ore recently discovered assays from 25 to 90 ounces in silver, and will average about 30 ounces in silver and forty per cent in lead, making it an excellent smelting grade. During the month, about three hundred tons of ore and iron have been shipped, and regular shipments from the new ore-bodies will begin on the first of April.

SUMMIT COUNTY.

ROBINSON CONSOLIDATED.—Mr. Greer's lease, which runs to March, 1884, is very elaborate, and the royalty varies from 30 to 60 per cent, according to the grade of the ore, and its location in the mine. The mine is now shipping about 20 or 25 tons a day of ore from the new ore-body, which is opening by the incline from the winze on the twelfth level, and is looking better daily. The ore averages about thirty ounces.

TEN MILE DISTRICT.

THE MAXIMUS AND BERNADOTTE.—The Leadville *Herald* reports as follows : Among the mines which have lately come to the front on Fletcher Mountain, Ten Mile, are the Maximus and Bernadotte, owned by the Colorado Land and Mineral Company. It has been reported that a rich strike was recently made in this property, and on calling on the manager, it was learned that such was the case. The Maximus is developed by two tunnels. Tunnel No. 1 has been driven 200 feet, with cross-cut to the north, which is in ore. Tunnel No. 2 is in a distance of 120 feet, and has exposed some very high-grade ore. From the No. 1 tunnel, at a distance of 85 feet from the mouth, a cross-cut has been run west fifty feet, cutting the Bernadotte vein, running parallel to the Maximus vein, and a drift has been run on the vein for a distance of 130 feet to where the important strike was made. The vein in the breast of the tunnel shows about three feet of high-grade ore. No ore can be shipped at present, and what is extracted in development-work is stacked up until the shipping season opens. The property is well arranged for working, with iron tracks in the tunnels, and other conveniences, and from the amount of ore yielded by the development-work alone, it is evident that it will make a good producer as soon as it is sufficiently opened up, and the shipments are begun.

## DAKOTA.

A dispatch from Deadwood to the New-York *Tribune* says that new or additional works are projected as follows : Homestake Company, 200-stamp mill ; Trojan Company, 100-stamp mill ; Lancaster, 100-stamp mill ; Caledonia, additional 40 stamps to its present 60-stamp mill ; Golden Summit, 20 additional stamps ; Florence silver mill, 20 additional stamps ; Oro Fino, hoisting-works and 20 additional stamps ; and a patent concentrator for Silver Creek property owned by a La Crosse company now organizing. In addition, there is talk of purchasing the Standby 60-stamp mill and connecting it by a narrow-gauge railroad with the Minnesota, five miles distant ; of large reduction-works by the King Solomon Company ; a mill for the Bengal Tiger ; another for certain Box Elder property owned by a company now organizing in New York ; and still another by the Berkshire Company. These latter, however, are not fully assured.

FATHER DE SMET.—The superintendent writes under date of March 19th as follows : Herewith express company's receipt for bar No. 155, 886·60 ounces gold, the result of run of mill for first half of March. On the 15th inst., I drew on Laidlaw & Co., for $18,000, which amount was for all February expenses. The north end tunnel is progressing slowly—only four men at work. I have no word of encouragement for this portion of the mine. On the second level, I have started a cross-cut west from Cook's chamber, which is now in ore, after passing through about 12 feet of slate. The third level header has not yet connected with the Italian winze, lacking about 8 feet of surveyed distance. Face of header in very poor material. The prospects for a large body of ore back of face of header and to the east of header are very good indeed. The rise from west cross-cut tramway level is progressing very slowly in very low-grade ore. In fact, I need not tell you that all our ore is very low grade ; but there are large bodies of it, and by economical working we shall continue to make some money for a number of years at least.

NIGGER HILL.—This company has resumed word on its 40-mile ditch, and expects to have every thing in readiness for hydraulicking by July 1st.

PORTLAND.—The company's mill, Bald Mountain, is now repairing, and the stamps will drop in about two weeks. The company's property has been idle for a long time, although it is considered valuable by all familiar with it.

SUMMIT.—The first clean-up of the mill (thirteen days' run) amounted to $3600, or about $25 a ton.

## GEORGIA.

COLUMBIA.—The grading is finished, together with all the trestling. A reservoir has been completed this week, and another is digging. The lumber for building the flume is mostly on the line, and building already begun. It is expected that the mill will commence work by the 1st of May.

FISH TRAP.—Work has been resumed at this mine.

## IDAHO.

### BLACKBURN MINING DISTRICT.

A correspondent of the Salt Lake *Tribune* states that this district promises to become a lively place this season. It is located on Little Lost River, seventy miles northwest of Blackfoot, and can also be reached from Camas Station, on the Utah & Northern, the distance being between sixty and seventy miles. Assays made of four lots of ore of the Ingersoll mine show results as follows: No. 1 went 18 per cent copper and 1570 ounces silver; No. 2, 189·58 ounces silver; No. 3, 157·76 ounces; and No. 4, 174·98 ounces.

The Daisy Black claim has developed so well that a smelter is to be built this spring to reduce the ores of this property, and also of the Great Northern.

The Tyndall is located on the Tyndall lode, which has been prospected between five and six miles. This great lode varies in width from 25 to 100 feet on the surface, and the outcroppings are well defined the entire distance prospected. Nine tons of ore from there were sold in this city at $118 per ton. The lay of the country, its excellent supply of water and timber, and its location in a country having good grazing lands, makes the district a desirable one, and it is attracting much interest among prospectors and mining men.

SAWTOOTH.—The stockholders, at a meeting in Ogden recently, elected the following officers: M. H. Beardsley, President; W. P. P. St. Clair, Vice-President; J. M. Langsdorf, Treasurer; A. C. Emerson, Secretary. The following gentlemen were elected directors for the ensuing year: Messrs. J. W. McNutt, J. W. Millis, W. H. Broadhead, W. Callahan, M. Buckmiller, F. A. Hall, R. J. Hill, William Van Dyke, and P. H. Emerson. The financial affairs of the company were found to be in good condition, and it was determined to prosecute development with renewed vigor.

## MAINE.

CHERRYFIELD.—Work at this mine has been suspended.

STEWART.—The new machinery is all in place, and work has started up. The new pump is set seventy feet from the surface, and does excellent work. Good progress will now be made in sinking and drifting, as the plant is complete, and every piece of machinery is of the very best workmanship.

## MEXICO.

The Pachuca courts have decided that the by-laws of a mining company are binding on stockholders, irrespective of the State code of mining laws.

BATOPILAS.—The new lixiviation-works have been completed. Rich silver was recently struck in an old working of the Veta Grande vein lately cleaned out. Some of the silver is nearly pure, and the vein has yielded steadily ever since. Eighty feet above a tunnel, another chute has just struck what seems to be a new chimney of silver, and the ore is very rich. Rails, etc., have arrived, and will be laid at once to connect the company's San Pedro and Martinez mines with the large reduction-works. This will enable it to deliver large quantities of ore to the mill, and much of the ore yields 200 ounces per ton. Another of the company's mines, the Giral, is giving large amounts of low-grade ores, running from 50 to 75 ounces per ton. The thirty additional stamps have arrived, and will be in operation by the end of May.

GUADALUPE.—The reduction-works at Pachuca are to be started in about a fortnight.

SANTA GERTRUDIS.—This mine has been thoroughly inspected by the members of the commission appointed at the last general meeting, and they are perfectly satisfied with the prospects of the mine. The various points show an abundance of high-grade mineral, and no cause is apparent for the suspension of dividends, so far as the production of the mine is concerned.

## MICHIGAN.

A find of copper ore was made recently north of Ishpeming. The discovery is testing as regards its extent. It is very rich in copper, though the deposit is thought to be but a small pocket.

DEER LAKE.—The company is supplying its furnace with flux from the limestone deposit on the lands of the Ropes Gold and Silver Company. This flux gives better results than any other yet tried by this company, and its close proximity to its works enables it to procure it more cheaply than it could get it from any outside source.

ROPES.—The shaft has attained a depth of thirteen feet. At the bottom of this shaft, the quartz vein proper measures exactly 45 inches, having increased four inches in width from surface. The quartz is a white crystalline, heavily charged with mineral, and shows a large amount of native gold and silver. The whole width of the vein carries gold and silver, and is not confined to a streak of a few inches, as is often the case in gold-bearing rock, though the usual characteristic of being richest along the "hanging," is apparently the case here. The vein casing, which is of slate, shows a large amount of mineral, the first few inches on each side of the lode appearing as rich as the quartz.

## MONTANA.

The mining operations of the past week, says the Butte *Miner*, may be characterized as active. While several smaller mines were shut down for repairs and the Dexter mill stopped for a clean-up and general overhauling of machinery, the principal mines and mills, like the Moulton, Alice, Lexington, Silver Bow, and Shonbar, were running with their accustomed regularity and producing their regular output.

## NEVADA.

ALBION.—The Eureka *Sentinel* states that a strenuous effort has been made to get all the attaching creditors of the Albion to sign the agreement, which has already been much discussed, and by which the miners, laborers, and mechanics would receive money for their wages and the mine be opened for work. The only signature lacking to complete the list was that of Tredennick, who declined all overtures to join the other creditors in their action under the proposed agreement. The presumption is, that this renders impossible the settlement that has been looked forward to with so much confidence. If an agreement can be had, the men will be paid off immediately, as the money is already here and in hand for that purpose.

MARTIN WHITE.—The superintendent's letter states that the ore discovered near the old Black chamber does not continue to look so well. The ground is still favorable for ore, and another cut or two may bring it in as strong as ever again. There is no particular change to report from the F. F. The west drift shows some improvement, and there is some very good ore coming in at the extreme west end, and appears to be going down toward the east.

NAVAJO.—The official report of March 22d shows: Total depth of shaft, 510 feet; progress since last report, 10 feet; cut a small seam of ore; no material change to note in the formation. Drift south, 350 level, advanced 19 feet; total length, 186 feet. The face shows a large width of vein-matter, yielding low assays, and altogether looking favorable. No material change in south drift, 450 level. The stopes are looking well at all points. Average battery assays of ore milled during the week, $235.62 per ton. Mill was closed down two and a quarter days, to make some necessary repairs.

## NEW MEXICO.

There is a mineral belt lying northeast and east of Albuquerque, beginning with the Cerillos Mining District and running southwestwardly to the mouth or western outlet of the Tijeras Cañon, which is for the second time beginning to attract a measure of attention in some degree commensurate with the extent and richness of the deposits of valuable minerals there found. For some twenty miles south of the town of Cerillos, those deposits are largely of gold and coal. Of coal there are immense beds, both hard and soft, much of it suitable for coking, and all of it of excellent quality, the depth of the beds varying from three to seven feet, and averaging fully four feet.

SAN PEDRO & CAÑON DEL AGUA.—In 1880, the Crescent Company began operations, and since then two new tunnels have been run and some 6000 feet of chambers and leads excavated. The vein is now known to be 36 feet in thickness, and it has been traced for two miles in the face of the mountain. While it is known distinctively as a copper mine, some portions of it also carry considerable gold, sufficient to pay for working. The ores are known as carbonates and sulphides. Sixty men are regularly employed at the mine, taking out ore and doing development-work. The smelting-works consist of a large building about 60 by 200 feet, containing two smelters with a capacity of thirty tons each; twenty-five stamp-mill, or crushers, including two Blake crushers and one Cornish roller; two engines of eight horse-power each; an upright eighth engine of eighty horse-power for the stamp-mills; two blowers, No. 5½, Wilbraham make.

## UTAH.

According to the Salt Lake *Tribune*, the Reed & Benson tunnel, begun six or seven years ago, is now in 2039 feet, and has evidently entered the peculiar limestone formation which produces, or in which is found, the Emma ore-bodies. The tunnel is as straight as an arrow, of grade sufficient so that a car will run out by gravity It is 1200 feet, vertical, below the croppings, and there are 500 feet, vertical, of virgin ground above it. At one time, the rock was so hard that it required five months to excavate 100 lineal feet of this tunnel. The same force now excavates 81 lineal feet in a month. There was ore of the usual high grade of this mine in four places in the bottom of the old workings, and it is of course anticipated that this same ore will be found to extend from those localities to the tunnel level and below. When Mr. F. C. Reed took charge of the work, he extracted, with 40 men, 1000 tons of ore in one winter, working from the top. The next winter he took out 900 tons, with six men, in the same time, working through a Reed & Benson opening to the surface lower down. He anticipates taking out ore, whenever he cuts it, for comparatively nothing. The tunnel has cost all the way from $4 to $21 per foot.

## PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

### GRANTED MARCH 6TH, 1883.

273,275. Amalgamating-Furnace. William E. Harris, New York City.
273,299. Steam-Boiler and other Furnaces. Orel D. Orvis, New York City.
273,309. Magnetic Ore-Separator. John Rae, New York City.
273,311. Blast-Furnace Plant. Jacob Reese, Pittsburg, Pa.
273,354. Brick-Kiln. John E. Gamble, East Liverpool, O.
273,367. Apparatus for Returning and Feeding Water to Boilers. Timothy J. Kieley, New York City.
273,397. Hydraulic Mining Machine. Jay E. Russell, San Francisco, Cal.
273,409. Drilling-Machine. Franz Voos, Solingen, Prussia, Germany.
273,421. Steam-Boiler Furnace. John Abell, Woodbridge, Ontario, Can.
273,477. Ore and Rock-Crusher. Miles B. Dodge, San Francisco, Cal.
273,478. Rock-Crusher. Miles B. Dodge, San Francisco, Cal.
273,583. Ore-Separator. Hiram P. Minot, Columbus, O., Assignor to Chester Minot, same place, and Samuel Watson, Cambridge City, Ind.
273,623. Method of and Apparatus for Making and Raising Salt-Brine from Deep Veins. George H. Smith, New York City.
273,661. Gas Combining and Heating Block for Furnace Bridge-Walls, etc. Robert R. Zell, Baltimore, Md.
273,662. Apparatus for Amalgamating and Concentrating Ores. John Alves, Dunedin, New Zealand.
273,679. Apparatus for Generating and Carbonating Hydrogen Gas. Leroy S. Groves, Afton, Iowa, Assignor of one half to John W. Shute, same place.

### GRANTED MARCH 13TH.

273,703. Machinery for Separating the Ores of the Precious Metals. Thomas P. Benton, La Crosse, Wis.
273,742. Blast-Furnace. William Kent, Alleghany, Pa., Assignor of one half to John Scott, Jersey City, N. J.
273,775. Dry Amalgamator. Isaac Stead, Philadelphia, Pa.
273,799. Furnace for Effecting the Protection of Iron and Steel Surfaces. Frederick S. Barff, Kilburn, County of Middlesex, and George Bower and Anthony S. Bower, St. Neats, County of Huntingdon, England; said Barff Assignor to said George and Anthony S. Bower.
273,840. Copper-Smelting Furnace. John B. F. Herreshoff, Brooklyn, N. Y., Assignor to himself and George H. Nichols and William H. Nichols, both of New York City.
273,917. Manufacture of Furnace Linings. Herman Ulsmann, Konigshütte, Prussia, Germany, Assignor to Edward Cooper, New York City.
273,965. Pumping System for Surface-Condensers. Charles W. Copeland, Brooklyn, N. Y.
273,969. Machine for Amalgamating and Concentrating Ores. George Dean, St. Louis, Mo.
274,035. Rock-Drill. Richard V. Rogers and James M. Allen, Larkinsville, Ala.
274,050. Pulverizing-Machine. Stephen P. M. Tasker, Philadelphia, Pa.
274,051. Hopper for Pulverizing-Machines. Stephen P. M. Tasker, Philadelphia, Pa.
274,055. Bessemer Converter. Sidney Gilchrist Thomas, Tedworth Square, County of Middlesex, England.
274,083. Apparatus for Separating Gold. John A. Cable, St. Louis, Mo.
274,090. Hopper for Pulverizing-Machines. Hermann B. Feldmann, Philadelphia, Pa., Assignor to Stephen P. M. Tasker, same place.

### GRANTED MARCH 20TH.

274,211. Amalgamator. William T. McGinnis, New York City.
274,215. Ore-Crushing Machine. Franklin Morey, Brooklyn, N. Y., Assignor to Oscar W. Turner, Oak Park, Ill.
274,243. Drilling-Machine. Edward J. Worcester, Worcester, Mass.
274,320. Regenerating-Furnace. Isaac Harper and Samuel Harper, Pittsburg, Pa.
274,357. Fire-Brick. William S. McKenna, Pittsburg, Pa., Assignor to Harbison & Walker, same place.
274,403. Metallurgic Furnace. Samuel P. Spooner, Bucklin, Assignor of fifty-one seventy-seconds to Daniel B. Holmes, Robert H. Drennon, William C. Duvall, and Emil Werk, all of Kansas City, Mo.
274,450. Furnace for Consuming Smoke and Heating Water. Edward Livermore, New York City, Assignor to Horace Galpen, same place.
274,453. Furnace for Burning Pyrites. James Mason, Eynsham Hall, Whitney, County of Oxford, England.

### GRANTED MARCH 27TH.

274,524. Continuous Rolling-Mill. Martin V. Smith, McKeesport, Pa.
274,525. Continuous Rolling-Mill. Martin V. Smith, McKeesport, Pa.
274,581. Dry-Ore Concentrator. Willard B. Farwell, New York City, Assignor of five eighths, by direct and mesne assignments, to John Landers and J. M. Taylor, San Francisco, Cal.
274,587. Cinder-Car. Frederick W. Gordon, Pittsburg, Pa., Assignor, by mesne assignments, to himself and James P. Witherow, same place.
274,667. Feed-Hopper and Bell for Blast and other Furnaces. Edwin Shepard, Goshen, Va.
274,678. Apparatus for Bending Rails and Bars. Ladislav Vojacek, Sinichov-Prague, Bohemia, Austria-Hungary.
274,717. Apparatus for Purifying Iron. Thomas H. Burridge, St. Louis, Mo., Assignor of one third to William L. Reynolds, same place.
274,740. Expansion Rotary Drill. Samuel W. Douglass, New York City, Assignor to the American Diamond Rock Boring Company, same place.
274,747. Apparatus for Separating Slate from Coal. John Fern, Hyde Park, Pa.
274,786. Cinder-Car. William Kelly, Scottdale, Pa.
274,829. Gas-Generator Stove. Nicholas H. Schilling and Hans Bunte, Munich, Bavaria, Germany, Assignors to Stettiner Chamottefabrik Actiengesellschaft, formerly Didier, Stettin, Germany.
274,856. Rolling-Mill. Richard Uren, Houghton, Mich.
274,882. Apparatus for Detecting Mineral Ores. Frederick H. Brown, Boulder, Colo.
274,884. Turbine-Wheel. Nathan F. Burnham, York, Pa.
274,889. Manufacture of Iron and Steel. James Henderson, Bellefonte, Pa.

## FINANCIAL.

### Gold and Silver Stocks.

NEW YORK, Friday Evening, April 6.

The mining market has been very dull, and depression has seemed the ruling feature. Sonora Consolidated has been the most active stock dealt in, and it was manipulated up and down at times in quite a lively manner. Robinson and Sierra Grande have been rather dull, and both stocks show weakness. The other stocks mostly dealt in were Amie, Decatur, Elko Consolidated, Lecrosse and Oriental & Miller. There is no material change in their prices. Below will be found a summary of the market. The total number of mining shares sold at all the Exchanges aggregates 421,415, as against 346,695 last week.

The Comstock shares have been very quiet at steady prices. California was quiet and steady, selling from 22@20@21c. Consolidated Virginia records a moderate business, and was a little stronger; it sold from 45@52 50c. Sierra Nevada had a small business at steady prices, selling from $2.20@$2.30. Union Consolidated was dealt in to the extent of 200 shares at $3.50@$3.40. Mexican was steady, under a small business, and sold at $2.88 @$3.13. Ophir sold at $2.25, with one small transaction. Sutro Tunnel was active and steady; it sold from 18@21c., the business aggregating 14,750 shares.

The Leadville stocks were also quiet and steady. Amie records a very active business, and suffered a slight decline from recent prices; it sold from 26@21c. Chrysolite was quiet and irregular, selling from $1.15@$1.25. Dunkin sold from 23@20c., with a business of 900 shares. Hibernia was quiet and a little weak at 4@3c. Iron Silver had a small business at steady prices, selling from $2.85 @$2.90. Leadville was quiet and steady; it sold from 71@68c. Little Chief records a business of 3000 shares at 39@42c. Big Pittsburg sold at 17@15c., under a small business. Climax was dealt in to the extent of 5000 shares at 9@7c.

The Bodie stocks were quiet and steady. Bodie Consolidated was quiet and steady, selling from 80@90c., assessment unpaid, and from $1.40@$1.45, assessment paid. Standard records strong prices under small transactions, and sold from $6.50@$7. Bulwer was quiet and a little weak, selling from 88@80c.

The Tuscarora stocks were almost neglected, and prices generally were weak. Grand Prize sold at 75c., assessment paid, and at 45c., assessment unpaid. Argenta was very quiet at 36c. Belle Isle records a small business at irregular prices, selling from 50@60 @50c. Navajo has grown weaker, declining from $3.60@$3.@$3.30 under a business of 4750 shares. North Belle Isle sold at 35c., with one transaction. Elko Consolidated was very active and a little weak, selling from 13 9@10c., with a business of 20,100 shares.

In the miscellaneous list, Alice has been quiet and steady; it sold from $2.85@$2.90. Eureka Consolidated developed a small business and was a little weak, selling from $5.25@$4.50@$4.75, assessment unpaid, and at $6@$6.25, assessment paid. The Green Mountain stocks were quiet and a little weak. Gold Stripe sold at 7@5c. Green Mountain was strong, selling from 75@82c. Rising Sun sold at 5@4c. and Cherokee at 3@2c. Horn-Silver records a small business, and was steady; it sold from $7.50@$7.88. Northern Belle showed signs of weakness, under a moderate business, declining from $10@ $8.63@$8.75. Robinson Consolidated was very active, and continues to grow weaker; it sold from 77@ 64c., closing at 67c. to-day, the sales amounting to 38,725 shares. Sierra Grande has been active and very irregular, selling from $1.85@$2@$1.80. Silver King records a small business at about steady prices, selling from $11@$10.75.

Alta-Montana was quiet and steady at 9@8c. Bradshaw records a small business at steady prices, selling from 30@28c. Central Arizona was quiet and steady; it sold from 30@33c. Decatur had an active business and was irregular, selling from 6@ 4@5c. Durango was quiet and steady at 5@6c. Harlem Milling and Mining Company had a fair business and continues strong; it sold from $1.40@$1.50@$1.45. Lacrosse was active and steady, selling at 15@14c., with a business of 12,600 shares. Oriental & Miller was also quite active and was strong; it sold from 15@18@17c. Rappahannock sold at 8c. under a small business. Red Elephant was steady at 7@6c. Silver Cliff records a small business and sold at 33@35c. Sonora Consolidated had a large business, and was very irregular; it sold up from 46@53c., then down to 40c., up again to 45c., closing weak at 35c. South Hite, new, was quiet and steady at 20@28c. South Pacific was active and steady, and sold at 6@5c. The State Line stocks were quiet and steady; Nos. 1 & 4 sold at 3@2c., and Nos. 2 & 3 at 6@4@5c. Taylor-Plumas records a small business at steady prices, selling from 18@ 17c.

The Directors of the National Petroleum Exchange have issued a circular to their members in regard to the proposed consolidation with the New York Mining Stock Exchange. It gives the terms of consolidation, points out the advantages to be derived, and concludes by stating that a general meeting will be held on Tuesday, April 10th, between eleven A.M. and four P.M., at which members will vote for necessary amendments to the by-laws and constitution of the Exchange, in order that the consolidation may be effected.

#### MEETINGS.

Bulwer Consolidated Mining Company, Room, 29, No. 309 Montgomery street, San Francisco, Cal. Annual meeting of stockholders and election of trustees, April 11th, at one o'clock P.M.

Fletcher Gold and Silver Mining Company, No. 211 Pearl street, New York City. Annual meeting of stockholders, April 10th, at twelve o'clock M.

Spring Valley Hydraulic Gold Company, No. 61 Broadway, New York City. Special meeting, called by a resolution of the Board of Trustees. Matters of importance will be presented. April 23d, at twelve o'clock M.

#### DIVIDENDS.

The Castle Creek Gold Mining Company, of Idaho, has declared its regular monthly dividend (No. 11) of three per cent, payable April 16th.

The Holyoke Mining Company, of Idaho, has declared its regular monthly dividend (No. 7) of two per cent, payable April 13th.

The Mount Pleasant Mining Company has declared a dividend of ten cents per share, payable at the office of Laidlaw & Co., No. 14 Wall street, New York City, April 16th.

The Navajo Mining Company, of Nevada, has declared a dividend of twenty-five cents per share.

The Standard Consolidated Mining Company, of California, has declared a monthly dividend of twenty-five cents a share, payable on April 12th, at the Farmers' Loan and Trust Company's office.

The Yellow Jacket Mining Company, of Nevada, has declared a dividend of twenty cents per share.

#### PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, brokers in Petroleum and Mining Stocks, No. 55 Broadway, report as follows for the week ended April 6th:

On Saturday, March 31st, oil opened at 94⅛c., and closed stronger at 95⅜c. Monday, it sold up to 96c. Tuesday and Wednesday, the fluctuations were chiefly between 94⅛c. and 95⅛c., and transactions were limited. Yesterday (Thursday), prices broke to 91¼c., rallied to 93⅜c. and reacted to 92c., and to-day the market was featureless at from 91 to 92¾c. There does not appear to be a well-defined idea concerning the wells lately opened up. That they have at least temporarily increased production is conceded; but from the history of the wells in the same formation, no great expectations are entertained of the permanence of the new production. The "mystery" which the owners of the Murphy well made has given way to the reliable report that its first day's product is 140 barrels, or relatively small; but as it lies inside the territory of the Cooper tract, greater significance is attached to it than would otherwise be the case. The latest candidate for honors as a "market-smasher" is the Welch well, about which conflicting reports have been circulated, but from present indications it will not prove a large producer.

The following table gives the quotations and sales at the New York Mining Stock Exchange:

| | Opening. | Highest. | Lowest. | Closing. | Sales. |
|---|---|---|---|---|---|
| March 31.... | $0.94 | $0.96⅛ | $0.94 | $0.95⅝ | 537,000 |
| April 2.... | .95¾ | .96⅛ | .93¾ | .94⅛ | 542,000 |
| 3.... | .94⅛ | .95⅛ | .93½ | .95 | 633,000 |
| 4.... | .95½ | .96⅛ | .94¼ | .94½ | 621,000 |
| 5.... | .93½ | .93⅝ | .91¼ | .92 | 864,000 |
| 6.... | .91⅜ | .92⅜ | .90¾ | .91 | 722,000 |
| Total sales. .... | | | | | 3,919,000 |

#### REVIEW OF THE SAN FRANCISCO MARKET.

The San Francisco market has not developed any material changes this week. The Comstock shares have been steady in price throughout, although a strong "boom" was developed in Hale & Norcross, made through a fight for the control of the company. The Yellow Jacket Company has declared a dividend of twenty cents per share. The Savage Company, on the other hand, has levied an assessment of $2.25 per share. The Tuscarora stocks have been weak, and show a decline. There are good reports from the mines, especially Navajo, but notwithstanding this, the stock has fallen off.

SAN FRANCISCO MINING STOCK QUOTATIONS

*Daily Range of Prices for the Week.*

| NAME OF COMPANY. | CLOSING QUOTATIONS. | | | | | |
|---|---|---|---|---|---|---|
| | Mar. 30. | Mar. 31. | April 2. | April 3. | April 4. | April 5. |
| Albion | .... | .... | .... | .... | .... | .... |
| Alpha | 1¼ | .... | .... | 1¼ | .... | 1¼ |
| Alta | 11-32 | .... | 11-32 | 13-32 | 13-32 | 11-32 |
| Bechtel | .... | .... | .... | .... | .... | .... |
| Belcher | ¾ | 21 32 | 19-32 | .... | 21-32 | 11-16 |
| Belle Isle | 9-16 | ½ | 9-16 | .... | 9-16 | 7-16 |
| Best & Belcher | 3¾ | 3¾ | 3¾ | 3¾ | 3¾ | 3¾ |
| Bodie | 27-32 | 27-32 | 27-32 | ¾ | 13-16 | 1⅛ |
| Bullion | .... | .... | .... | .... | .... | .... |
| California | ¼ | .... | 3-16 | .... | ¼ | ¼ |
| Chollar | .... | .... | .... | .... | .... | .... |
| Con. Virginia | 7-16 | ½ | ½ | ½ | ½ | ½ |
| Crown Point | 15-16 | 29-32 | 29-32 | .... | 27-32 | 51-16 |
| Elko Cons | .... | .... | .... | 3-32 | .... | .... |
| Eureka Con | 5 | 4¾ | 5 | 5¼ | 5¼ | 5¼ |
| Exchequer | .... | ¼ | .... | .... | ¼ | ¼ |
| Gould & Curry | 2⅛ | 2⅛ | 2⅝ | 2⅝ | 2¾ | 2⅛ |
| Grand Prize | ½ | 7-16 | 7-16 | .... | ½ | 7-16 |
| Hale & Norcross | 2⅛ | 2⅛ | 2⅝ | 3¼ | 3⅛ | 3⅛ |
| Independence | 13-32 | .... | 13-32 | .... | 11-32 | 11-16 |
| Martin White | 5-16 | 5-16 | 5-16 | .... | 5-16 | 5-16 |
| Mexican | 2⅞ | 3 | 2⅞ | 3 | 2⅞ | 3 |
| Mono | .... | .... | .... | .... | .... | .... |
| Mount Diable | 2¾ | 2¾ | .... | 3½ | 2⅝ | .... |
| Navajo | 3½ | 3¼ | 3½ | 3⅜ | 3¼ | 3⅜ |
| Northern Belle | 9⅛ | 9½ | 9¾ | 9 | 8½ | 8⅞ |
| North Belle Isle | 5-16 | .... | 11-32 | .... | .... | .... |
| Ophir | 2¼ | 2⅜ | 2¼ | 2⅜ | 2⅜ | 2⅜ |
| Overman | .... | .... | .... | .... | .... | .... |
| Potosi | .... | 29-32 | 15-16 | 1⅛ | 1⅛ | 1⅛ |
| Savage | .... | .... | .... | .... | .... | .... |
| Scorpion | .... | .... | .... | .... | .... | .... |
| Sierra Nev | 2⅜ | 2⅜ | 2⅜ | 2⅜ | 2⅜ | 2⅜ |
| Silver King | .... | .... | .... | 11 | .... | .... |
| Tip Top | .... | .... | .... | .... | .... | .... |
| Union Con | 3⅝ | 3⅝ | 3½ | 3⅝ | 3½ | 3½ |
| Wales Con | ¼ | ¼ | 3-16 | ¼ | 3-16 | 3-16 |
| Yellow Jacket | 2½ | 2⅞ | 2⅝ | 2¾ | 2¾ | 2⅞ |

### Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, April 5.

To-day being Fast-day, there have been no quotations, the Exchanges being closed. Our report is made up to the close of business on the 4th. The decline in ingot copper to 16c. per pound for Lake has had a depressing tendency on the market for copper stocks; and although the decline has not been very marked as yet, any efforts to sell large blocks of stocks would result in much lower prices than we have seen for some years. Calumet & Hecla has ruled dull, with small sales at $242@$241. Franklin declined from $12@$11. Although the latest advices from the mine are favorable, yet the lower price of ingot copper will doubtless prevent the payment of a dividend the coming year. Pewabic declined from $6 (March 22d) to $5. The outlook for this company is not as favorable as its friends would desire. Quincy started off this week with an advance from $49½@$50, with a gradual decline from this figure to $49¼, and has held quite firm at $49 bid. The March product of this mine was 225 tons, against 195 tons last year. Osceola declined from $29@26, with a subsequent recovery to $27. There is more of this stock offering than usual, and a further decline would not be unexpected. Atlantic, on a small sale, advanced from $11@$12. Huron, the last sale of which was on March 7th, at $1½, showed exceeding weakness to-day by selling at 50c. Advices from the mine, under date of March 24th, state that the mine is looking as well as ever; but we suspect that later news has something to do with the decline and pressure to sell the stock to-day. Allouez sold at $2¼, an advance of 25c.

In silver stocks, Bonanza advanced from $1@$2¼. Catalpa declined from 45@40c., but later advanced to 47½c., closing at 45c. bid. San Pedro advanced from 50@60c. Harshaw sold at 75c., and Sullivan at $1. At the Mining Exchange, there was no special feature. Prices are generally lower, and business dull and uninteresting.

# DIVIDEND-PAYING MINES.

| | NAME AND LOCATION OF COMPANY. | | CAPITAL STOCK. | SHARES. No. | SHARES. Par value. | ASSESSMENTS. Total levied to date. | ASSESSMENTS. Date and amount per share of last. | DIVIDENDS. Total paid to date. | DIVIDENDS. Date and amount per share of last. | | § | | HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. March 31. H. | March 31. L. | April 2. H. | April 2. L. | April 3. H. | April 3. L. | April 4. H. | April 4. L. | April 5. H. | April 5. L. | April 6. H. | April 6. L. | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Alice, S. C. | Mont | $10,000,000 | 400,000 | $25 | * | | $400,000 | Dec. 1881 | .10 | | 1 | 2.90 | 2.85 | 2.90 | 2.85 | 2.90 | | | | | | | 600 |
| 2 | Amie Con, S. L. | Colo. | 5,000,000 | 500,000 | 10 | * | | 305,000 | May 1880 | .10 | | 2 | .26 | .24 | .24 | | .24 | .23 | .23 | | .21 | .21 | .21 | 26,000 |
| 3 | Atlantic, C. | Mich | 1,000,000 | 40,000 | 25 | $280,000 | Apl. 1875 | 220,000 | Feb. 1883 | $2.00 | E. | 3 | | | | | | | | | | | | |
| 4 | Argenta, S | Nev. | 10,000,000 | 100,000 | 100 | 225,000 | Nov 1882 | 40,000 | Feb. 1880 | .20 | | 4 | | | .30 | | | | | | | | | 300 |
| 5 | Barbee & Walker, S. | Utah | 1,000,000 | 100,000 | 10 | * | | 60,000 | Nov 1880 | .10 | | 5 | | | | | | | | | | | | |
| 6 | Bassick, G. S. | Colo. | 10,000,000 | 100,000 | 102 | * | | 125,000 | Apl. 1883 | 1.00 | | 6 | | | | | | | | | | | 9.50 | 10 |
| 7 | Belle Isle, S. | Nev. | 10,000,000 | 100,000 | 100 | 65,000 | May 1882 | 300,000 | Dec. 1879 | .25 | | 7 | | | .50 | | .60 | | | | | | .50 | 800 |
| 8 | Black Bear, G. | Cal. | 3,000,000 | 30,000 | 100 | 15,000 | Sept 1879 | 849,000 | Sept 1882 | .30 | | 8 | | | | | | | | | | | | |
| 9 | Belcher, G. S. | Nev. | 10,400,000 | 104,000 | 100 | 2,562,000 | Sept 1882 | 15,397,000 | Apl. 1876 | 1.00 | S.F. | 9 | | | | | | | | | | | | |
| 10 | Birdseye, G. | Cal. | | 15,000 | | | | | Dec. 1882 | | | 10 | | | | | | | | | | | | |
| 11 | Bodie Con., G. | Cal. | 10,000,000 | 100,000 | 100 | 175,000 | Mch 1883 | 1,295,000 | Nov 1882 | .20 | S.F. | 11 | .85 | .80 | .85 | | | | | | | | 1.45 | .90 | 1,150 |
| 12 | Bonanza Developm't | C&M | 3,000,000 | 300,000 | 10 | | | 135,000 | Oct.. 1882 | .15 | | 12 | | | | | | | | | | | | |
| 13 | Boston & Mont, G. | Mont | 2,000,000 | 200,000 | 10 | * | | 310,000 | Jan. 1883 | .05 | | 13 | | | | | | | | | | | | |
| 14 | Breece, S. | Colo. | 5,000,000 | 200,000 | 25 | * | | 2,000 | Feb. 1880 | .01 | P. | 14 | | | | | | | | | | | | |
| 15 | Bulw'r, G. | Cal | 1,000,000 | 100,000 | 100 | 30,000 | Dec. 1877 | 155,000 | Apl. 1883 | .05 | | 15 | .88 | .87 | | | .86 | .85 | .83 | .80 | | | | 1,500 |
| 16 | California, G. S. | Nev. | 54,000,000 | 540,000 | 100 | 746,000 | Feb. 1883 | 31,320,000 | Dec. 1879 | .50 | | 16 | | | | | .22 | .21 | .21 | .20 | .21 | | | 2,700 |
| 17 | Calumet & Hecla, C. | Mich | 2,500,000 | 100,000 | 25 | | | 22,850,000 | Feb. 1883 | 5.00 | B. | 17 | | | | | | | | | | | | |
| 18 | Carbonate Hill, S. L. | Colo. | | | | | | 30,000 | Apl. 1883 | .05 | | 18 | 1.20 | | 1.20 | | | | | | 1.30 | 1.25 | 1.10 | 1.00 | 2,400 |
| 19 | Caribou Con., S. | Colo. | 1,000,000 | 100,000 | 10 | * | | 50,000 | Mch 1880 | .10 | | 19 | .14 | | | | | | | | | | | 200 |
| 20 | Carolina Queen, C. | N. C. | 200,000 | 100,000 | 2 | * | | 8,000 | Oct. 1882 | .02 | | 20 | | | | | | | | | | | | |
| 21 | Castle Creek, G. | Idah. | 100,000 | 100,000 | 1 | | | 33,000 | Apl. 1883 | .03 | B. | 21 | | | | | | | | | | | | |
| 22 | Catalpa, S L | Colo. | 3,000,000 | 300,000 | 10 | * | | 210,000 | Dec. 1882 | .10 | | 22 | | | | | | | | | | | | |
| 23 | Central, C. | Mich | 500,000 | 20,000 | 25 | 100,000 | Sept 1861 | 1,670,000 | Feb. 1883 | 3.00 | | 23 | | | | | | | | | | | | |
| 24 | Christy, S. | Utah | 6,000,000 | 60,000 | 100 | | | 90,000 | Jan. 1883 | .10 | B. | 24 | | | | | | | | | | | | |
| 25 | Chrysolite, S. L. | Colo. | 10,000,000 | 200,000 | 50 | * | | 1,600,000 | Dec. 1881 | .50 | | 25 | 1.25 | 1.15 | 1.20 | 1.15 | 1.15 | | 1.25 | 1.15 | 1.20 | | 1.25 | 1.10 | 3,680 |
| 26 | Con. Gold Mining, G. | Ga. | 500,000 | 100,000 | 5 | * | | 92,000 | Mar. 1883 | .04 | S.F. | 26 | | | | | | | | | | | | |
| 27 | Con. Virginia, G. S. | Nev. | 54,000,000 | 540,000 | 100 | 897,000 | Aug 1882 | 42,930,000 | Aug. 1880 | .50 | | 27 | .48 | .45 | .48 | | .49 | .48 | .52 | .50 | .50 | | .51 | .50 | 8,325 |
| 28 | Contention, S. | Ariz. | 12,500,000 | 250,000 | 50 | | | ‡2,274,000 | Mch. 1883 | .25 | | 28 | | | | | | | | | | | | |
| 29 | Copper Queen, C. | Ariz. | 2,500,000 | 250,000 | 10 | * | | 975,000 | Apl. 1883 | .50 | S.F. | 29 | | | | | | | | | | | | |
| 30 | Crown Point, G. S. | Nev. | 10,000,000 | 100,000 | 100 | 2,673,000 | Feb. 1882 | 11,588,000 | Jan. 1875 | 2.00 | | 30 | | | | | | | | | | | | |
| 31 | Deadwood Terra, G. | Dak. | 5,000,000 | 200,000 | 25 | * | | †990,000 | Jan. 1883 | .10 | B. | 31 | | | | | | | | | | | | |
| 32 | Dunkin, S. C. | Colo. | 5,000,000 | 200,000 | 25 | * | | 200,000 | July 1881 | .07½ | S.F. | 32 | .23 | .20 | | | | | | | | | | 900 |
| 33 | Eureka Con., G. S. L. | Nev. | 5,000,000 | 50,000 | 100 | 150,000 | Mch 1883 | 1.00 | 4,767,500 | July 1882 | .25 | | 33 | 5.25 | 5.00 | 5.00 | 4.50 | 5.13 | | 6.00 | 4.75 | | 6.25 | | 990 |
| 34 | Evening Star, S. L. | Colo. | 500,000 | 50,000 | 10 | * | | 1,225,000 | O t.. 1882 | .50 | | 34 | | | | | | | | | | | | |
| 35 | Excelsior, G. | Cal.. | 10,000,000 | 100,000 | 100 | 300,000 | Jan. 1882 | 1.00 | 875,000 | Oct.. 1880 | .25 | | 35 | | | | | | | | | | | | |
| 36 | Father de Smet, G. | Dak.. | 10,000,000 | 100,000 | 100 | | | 570,000 | Feb. 1883 | .20 | | 36 | 4.50 | | | | | | | | | | 4.63 | | 125 |
| 37 | Franklin, C. | Mich | | 54,000 | | 560,000 | Jun 1877 | 24,000 | | | | 37 | | | | | | | | | | | | |
| 38 | Freeland, S. | Colo. | 5,000,000 | 200,000 | 25 | * | | 50,000 | May 1880 | .25 | | 38 | | | | | | | | | | | | |
| 39 | Fresno Enterprise, G | Cal. | 5,000,000 | 100,000 | 50 | | | 110,000 | July 1882 | .10 | S.F. | 39 | | | | | | | | | | | | |
| 40 | Gem S | Colo. | 125,000 | 125,000 | 1 | * | | 21,250 | Mch 1883 | .02 | S.F. | 40 | | | | | | | | | | | | |
| 41 | Glass-Pendery, S. L | Colo. | 5,000,000 | 250,000 | 20 | * | | 25,000 | May 1881 | .10 | | 41 | | | | | | | | | | | | |
| 42 | Glen. S. | Colo. | 100,000 | 100,000 | 1 | | | 6,000 | Mch 1883 | .01 | | 42 | | | | | | | | | | | | |
| 43 | Gould & Curry, G. S. | Nev.. | 10,000,000 | 100,000 | 100 | 3,476,000 | Sept 1882 | .50 | 3,820,000 | Oct. 1870 | 10 00 | S.F. | 43 | | | | | | | | | | | | |
| 44 | Grand Central, S. | Ariz. | 1,000,000 | 100,000 | 10 | | | 625,000 | Dec. 1882 | .25 | | | 44 | | | | | | | | | | | | |
| 45 | Grand Prize, S. | Nev.. | 10,000,000 | 100,000 | 100 | 445,000 | Mch 1883 | .25 | 450,000 | Sept 1880 | .25 | | 45 | | | .75 | | | | | .45 | | | 200 |
| 46 | Granite, S. | Colo. | 125,000 | 125,000 | 1 | * | | 5,000 | Mch 1883 | .01 | | | 46 | | | | | | | | | | | | |
| 47 | Great Eastern, G. | Dak.. | 300,000 | 300,000 | 1 | * | | 16,000 | July 1880 | .01 | | | 47 | | | | | | .02 | | | | | | 1,300 |
| 48 | Great Western, Q. | 'al.. | 5,000,000 | 50,000 | 100 | 35,500 | Aug 1873 | .15 | 262,500 | Oct.. 1882 | .25 | | 48 | | | | | | | | | | | | |
| 49 | Green Mountain, G. | Cal.. | 1,250,000 | 125,000 | 10 | * | | 212,000 | Nov. 1881 | .07½ | | | 49 | .76 | .75 | .80 | .75 | | | | | | .82 | | 1,800 |
| 50 | Hale & Norcross, G. S | Nev.. | 11,200,000 | 112,000 | 100 | 4,066,000 | Sept 1882 | .50 | 1,596,000 | Apl. 1871 | 5.00 | | 50 | | | | | | | | | | | | |
| 51 | Hall-Anderson, G. | N. S. | 150,000 | 150,000 | 1 | | | 7,000 | Jan. 1882 | .05 | | | 51 | | | | | | | | | | | | |
| 52 | Hecla Con., S. | Mont | 1,500,000 | 30,000 | 50 | | | 387,000 | Jan. 1883 | .50 | S.F. | | 52 | | | | | | | | | | | | |
| 53 | Henriett, L. | Colo. | | 270,000 | | | | | Feb. 1883 | | B | | 53 | | | | | | | | | | | | |
| 54 | Hibernia, S. L. | Colo. | 7,500,000 | 300,000 | 25 | * | | 180,000 | July 1881 | .40 | | | 54 | | | | | | .04 | | .04 | | .03 | | 2,500 |
| 55 | Holyoke, G. | Idah. | 200,000 | 200,000 | 1 | | | 396,000 | Apl. 1883 | .02 | | | 55 | | | | | | | | | | | | |
| 56 | Homestake, G. | Dak | 12,500,000 | 125,000 | 100 | 200,000 | July 1878 | 1.00 | 1,912,500 | Mch 1883 | .40 | | | 56 | 15.75 | | | | | | | | | | 10 |
| 57 | Hope, S. | Mont | 400,000 | 8,000 | 50 | * | | 91,124 | Mch 1883 | 1.50 | | | 57 | | | | | | | | | | | | |
| 58 | Horn-Silver, S. L. | Utah | 10,000,000 | 400,000 | 25 | * | | 2,000,000 | Feb. 1883 | .75 | | | 58 | 7.75 | | 7.50 | | 7.63 | 7.70 | 7.75 | | 7.88 | 7.75 | | 1,125 |
| 59 | Hukill, G. S. | Colo. | 1,000,000 | 200,000 | 5 | * | | 210,000 | Dec. 1878 | .10 | | | 59 | | | .16 | | .16 | | .14 | | | | | 2,000 |
| 60 | Idaho, G. | Cal.. | 310,000 | 3,100 | 100 | | | 3,341,250 | Feb. 1883 | 2.50 | | | 60 | | | | | | | | | | | | |
| 61 | Independence, S. | Nev.. | 10,000,000 | 100,000 | 100 | 215,000 | Mch 1883 | .30 | 225,000 | Sept 1879 | .25 | | | 61 | .32 | | | | | | | | | | 50 |
| 62 | Indian Queen, S. | Nev.. | 250,000 | 125,000 | 2 | | | 365,000 | Nov 1882 | .02 | B. | | 62 | | | | | | | | | | | | |
| 63 | Inyo, G | Cal.. | 500,000 | 100,000 | 5 | * | | 45,000 | Apl. 1882 | .05 | | | 63 | | | | | | | | | | | | |
| 64 | Iron-Silver, S. L. | Colo. | 10,000,000 | 500,000 | 20 | * | | 1,000,000 | Mch 1883 | .20 | S.F. | | 64 | 2.90 | | | | 2.90 | | 2.85 | | | 2.90 | | 1,500 |
| 65 | Jocuistita, S. | Mex. | 10,000,000 | 100,000 | 100 | | | 800,000 | Feb. 1883 | .50 | | | 65 | | | | | | | | | | | | |
| 66 | Kentuck | Nev.. | 3,000,000 | 30,000 | 100 | 342,000 | Nov 1881 | .30 | 1,252,000 | Mch 1883 | .10 | | | 66 | | | | | | | | | | | |
| 67 | La Plata, S. L. | Colo. | 2,000,000 | 200,000 | 10 | * | | 610,000 | Sept 1882 | .30 | E. | | 67 | | | | | | | | | | | | |
| 68 | Leadville, S. L. | Colo. | 4,000,000 | 400,000 | 10 | * | | 270,000 | Jan. 1883 | .05 | | | 68 | .71 | .68 | | | | | .70 | .68 | .68 | | | 3,400 |
| 69 | Leeds, S. | Utah | 6,000,000 | 60,000 | 100 | 87,000 | July 1882 | .50 | 78,000 | Oct.. 1878 | .15 | S.F. | | 69 | | | | | | | | | | | |
| 70 | Little Chief, S. L. | Colo. | 10,000,000 | 200,000 | 50 | * | | 700,000 | Aug. 1880 | .50 | | | 70 | .40 | .39 | | | .40 | .39 | .40 | .39 | | | .42 | .40 | 3,000 |
| 71 | Little Pittsburg, S. L | Colo. | 20,000,000 | 200,000 | 100 | * | | 1,059,000 | Mch 1880 | .50 | | | 71 | | | | | | | | | | | .62 | | 100 |
| 72 | Marguerite, G. | Cal.. | 500,000 | 25,000 | 20 | | | 18,750 | Oct.. 1882 | .25 | S.F. | | 72 | | | | | | | | | | | | |
| 73 | Martin White, S. | Nev.. | 10,000,000 | 100,000 | 100 | 975,800 | Mch 1883 | .25 | 90,000 | July 1879 | .30 | B. | | 73 | | | | | | | | | | | |
| 74 | Minas Nuevas, S. | Mex. | 300,000 | 100,000 | 3 | * | | 20,000 | July 1882 | .10 | | | 74 | | | | | | | | | | | | |
| 75 | Morning Star, S. L. | Colo. | 1,000,000 | 100,000 | 10 | r. | | 565,000 | Dec. 1882 | .25 | | | 75 | | | | | | | | | | | | |
| 76 | Napa, Q | Cal.. | 700,000 | 100,000 | 7 | | | 290,000 | Jan. 1883 | .10 | | | 76 | | | | | | | | | | | | |
| 77 | Navajo, G. S. | Nev.. | 10,000,000 | 100,000 | 100 | 235,000 | Mch 1882 | .20 | 200,000 | Apl. 1883 | .25 | | | 77 | 3.60 | 3.55 | 3.50 | 3.25 | 3.45 | 3.40 | 3.25 | | 3.15 | 3.00 | 3.30 | 3.10 | 4,750 |
| 78 | New York Hill, G. | Cal.. | 5,000,000 | 50,000 | 100 | 55,000 | Mch 1878 | .20 | 215,000 | Aug. 1882 | .10 | | | 78 | | | | | | | | | | | | |
| 79 | New York & Colo., G. | Colo. | 1,250,000 | 50,000 | 25 | | | 25,000 | July 1879 | .10 | | | 79 | | | | | | | | | | | | |
| 80 | Northern Belle, S. | Nev.. | 5,000,000 | 50,000 | 100 | | | 2,375,000 | Mch 1883 | .50 | B. | | 80 | 9.88 | | 10.00 | 9.75 | 9.75 | 9.25 | 9 38 | | 5.75 | | 8.75 | 8.63 | 1,135 |
| 81 | North Belle Isle, S. | Nev.. | 10,000,000 | 100,000 | 100 | 75,000 | Nov 1882 | .20 | 30,000 | Aug. 1881 | .15 | | | 81 | | | .35 | | | | | | | | | 500 |
| 82 | Ontario, S. L. | Utah | 15,000,000 | 150,000 | 100 | | | 4,925,000 | Jan. 1883 | .50 | | | 82 | 24.13 | | | | | | 27.50 | | 27.75 | | 27.50 | 27.13 | 220 |
| 83 | Ophir, G. S. | Nev.. | 10,000,000 | 100,000 | 100 | 3,495,000 | Dec. 1882 | 1 00 | 1,595,000 | July 1882 | 1.00 | B. | | 83 | | | | | | | 2.25 | | | | | 20 |
| 84 | Osceola, C. | Mich | 1,250,000 | 50,000 | 25 | 480,000 | Apl. 1876 | 1.60 | 835,000 | Mch 1883 | 1 00 | | | 84 | | | | | | | | | | | |
| 85 | Oxford, G. | N. S. | | 100,000 | | | | | 5,000 | Mch 1883 | .05 | | | 85 | | | | | | | | | | | |
| 86 | Pleasant Valley, G. S. | Cal.. | 10,000,000 | 100,000 | 100 | | | | 30,000 | Dec. 1882 | .05 | S.F. | | 86 | | | | | | | | | | | |
| 87 | Polonia, S. | Colo. | 200,000 | 8,000 | 25 | | | | 12,000 | | 1882 | 1.50 | | 87 | | | | | | | | | | | |
| 88 | Prussian, S. L. | Colo | 1,500,000 | 150,000 | 10 | | | | 132,000 | Jan 1883 | .10 | | | 88 | | | | | | | | | | | |
| 89 | Quick-Silver, pref., Q. | Cal.. | 4,300,000 | 43,000 | 100 | | | | 654,000 | July 1882 | 6.00 | P. | | 89 | | | | | | | | | | | |
| 90 | " com., Q | Cal.. | 5,700,000 | 57,000 | 100 | 200,000 | | | 151,000 | July 1882 | .40 | | | 90 | | | | | | | 8.25 | | | 8.50 | | 200 |
| 91 | Quincy, C. | Mich | 1,200,000 | 40,000 | 25 | | Dec. 1862 | 5.00 | 3,570,900 | Feb. 1883 | 6.00 | S.F. | | 91 | | | | | | | | | | | |
| 92 | Renfrew, G. | N. S. | 60,000 | 30,000 | 2 | | | | 4,800 | July 1882 | .02 | | | 92 | | | | | | | | | | | |
| 93 | Richmond, S. L. | Nev.. | 1,350,000 | 54,000 | 25 | * | | | 3,907,587 | Jan. 1883 | 2.50 | E. | | 93 | | | | | | | | | | | |
| 94 | Rising Sun, S. | Dak.. | 750,000 | 150,000 | 5 | * | | | 52,000 | May 1881 | .07½ | | | 94 | .05 | | | | .05 | | .04 | | .05 | .04 | | 3,400 |
| 95 | Robinson Bar, G. | Idah. | 100,000 | 100,000 | 1 | * | | | 9,000 | Dec. 1882 | .03 | | | 95 | | | | | | | | | | | |
| 96 | Robinson Con, S. L. | Colo. | 10,000,000 | 200,000 | 50 | | | | 575,000 | Nov 1881 | .50 | | | 96 | .77 | .70 | .76 | .70 | .75 | .73 | .74 | .72 | .72 | .70 | .71 | .64 | 38,725 |
| 97 | Robert E Lee, S. L. | Colo. | 250,000,000 | 500,000 | 500 | | | | 100,000 | Dec. 1882 | .10 | E. | | 97 | | | | | | | | | | | |
| 98 | San Francisco, C. | Cal.. | | 50,000 | | | | | 25,000 | Jan. 1883 | .05 | | | 98 | | | | | | | | | | | |
| 99 | Savage, S. | Nev.. | 11,200,000 | 112,000 | 100 | 5,736,000 | Apl. 1883 | 2.25 | 4,460,000 | July 1869 | 3.00 | B. | | 99 | | | | | | | | | | | |
| 100 | Shoshone, G. | Idah. | 150,000 | 150,000 | 1 | | | | 6,000 | Mch 1883 | .01 | | | 100 | | | | | | | | | | | |
| 101 | Sierra Buttes, G. | Cal.. | | 22,500 | 10 | | | | 1,429,683 | Oct.. 1882 | .25 | E. | | 101 | | | | | | | | | | | |
| 102 | Sierra Grande, S. | N. M. | 10,000,000 | 400,000 | 25 | | | | 600,000 | Apl. 1883 | .25 | | | 102 | 1.90 | 1.85 | 2.00 | 1.85 | 1.90 | 1.85 | 2.00 | 1.95 | 1.95 | 1.90 | 1.80 | | 13,100 |
| 103 | Sierra Nevada, G. S. | Nev.. | 10,000,000 | 100,000 | 100 | 5,250,000 | Mch 1883 | 1.00 | 102,000 | Jan. 1871 | 1.00 | P. | | 103 | 2.25 | | | | 2.25 | | 2.38 | 2.20 | | | 2.30 | | 555 |
| 104 | S'a P'mas Eureka, G | Cal.. | | 40,635 | | | | | | Apl. 1882 | | B. | | 104 | | | | | | | | | | | |
| 105 | Silver King, S. | Ariz. | 1,000,000 | 100,000 | 100 | | | | 1,200,000 | Mch 1883 | .25 | S.F. | | 105 | 11.00 | | | | 11.00 | | 10.75 | | | | | | 150 |
| 106 | Silver King, S. | Colo. | 1,000,000 | 500,000 | 2 | | | | 50,000 | Aug. 1881 | .10 | | | 106 | | | | | | | | | | | |
| 107 | Smuggler, S. L. | Colo. | 600,000 | 60,000 | 10 | | | | 27,900 | Mch 1883 | .10 | | | 107 | | | | | | | | | | | |
| 108 | Socorro, C. | N. M. | 250,000 | 2,500 | 100 | | | | 4,000 | Mch 1882 | .00¾ | B. | | 108 | | | | | | | | | | | |
| 109 | Spring Valley, G. | Cal.. | 200,000 | 200,000 | 1 | * | | | 50,000 | Jan. 1881 | .25 | | | 109 | | | | | | | | | | | |
| 110 | Standard, G. S. | Cal.. | 10,000,000 | 100,000 | 100 | | | | 4,125,000 | Apl. 1883 | .25 | | | 110 | | | | | 6.75 | | 7.00 | 6.50 | | | | | 150 |
| 111 | Stormont, S. | Utah | 200,000 | 200,000 | 1 | * | | | 155,000 | Nov 1881 | .05 | | | 111 | | | | | | | | | | | |
| 112 | St. Joseph, L. | Mont | 1,000,000 | 100,000 | 10 | * | | | 390,000 | Dec. 1882 | .20 | | | 112 | | | | | | | | | | | |
| 113 | Tip Top, S. | Ariz. | 10,000,000 | 100,000 | 100 | 195,000 | Mch 1883 | .25 | 100,000 | Nov 1881 | .20 | | | 113 | | | | | | | | | | | |
| 114 | Tombstone, G. S. | Ariz | 12,500,000 | 500,000 | 25 | * | | | 1,250,000 | Apl. 1882 | .10 | B. | | 114 | | | | | | | | | | | |
| 115 | United Gregory, G. | Colo | 300,000 | 300,000 | 1 | | | | 26,250 | Oct.. 1882 | .50 | | | 115 | | | | | | | | | | | |
| 116 | United Gold Min. Co. | Colo. | | | | | | | | Oct.. 1883 | .05 | | | 116 | | | | | | | | | | | |
| 117 | Vizina, S. | Ariz. | 5,000,000 | 200,000 | 25 | * | | | 140,000 | Apl. 1882 | .10 | E. | | 117 | | | | | | | | | | | |
| 118 | Yellow Jacket, G. S. | Nev.. | 12,000,000 | 120,000 | 100 | 5,358,000 | Feb. 1882 | 1.00 | 2,208,000 | Apl. 1883 | .20 | B. | | 118 | | | | | | | | | | 2.00 | 1.88 | 400 |
| 119 | Yuba, G. | Cal.. | 5,000,000 | 200,000 | 25 | | | | 4,000 | Sept 1881 | 1.00 | | | 119 | | | | | | | | | | | |

* Non-assessable. † The Deadwood has previously paid $275,000 in eleven dividends, and the Terra $75,000. ‡ This company, as the Western, up to December 10th, 1881, paid $1,475,000. Quotations of these stocks will be found in S. F., San Francisco; B., Boston; and P., Philadelphia, tables. E are British mines. Dividend shares sold, 140,655.

3. P.M.—There was no special feature to the market this afternoon. Below are the closing prices: Allouez, $2@$2¼. Atlantic, $10¼@$12. Antimony, $14@$15. Bonanza, $2⅛ bid. Calumet & Hecla, $240 bid. Catalpa, 45c. bid. Crescent, 20@25c. Franklin, $10⅝@$11. Harshaw, $1 asked. Huron, 50c. bid. National, $1⅛ asked. Osceola, $25@$27. Pewabic, $4@$5. Quincy, $49@$49¼. Silver Islet, $2½ bid. Sullivan, $1 asked. San Pedro, 55@60c.

## METALS.

NEW YORK, Friday Evening, April 6.

**Copper.**—During the week, the leading Lake companies astonished the trade by offering Lake copper freely at 16c., and some sales, aggregating possibly 400,000 pounds, were made at that figure, and it is rumored at even less. This action clears the sky for the time being; and after consumers have become convinced that they will not be able to do much better, a livelier buying movement will be inaugurated. In consequence of the constant decline in the price of the raw material, values of manufactured goods, though nominally prices were unchanged, have fallen off steadily, and the cutting which has gone on for months has demoralized the customers. The opportunity is now offered to restore confidence, and then

## NON-DIVIDEND-PAYING MINES.

| | Name and Location of Company. | | Capital Stock. | Shares. Number. | Shares. Par Value. | Assessments. Total levied to date. | Assessments. Date and amount per share of last. | | | Highest and Lowest Prices per Share at which Sales were Made. March 31. H. | March 31. L. | April 2. H. | April 2. L. | April 3. H. | April 3. L. | April 4. H. | April 4. L. | April 5. H. | April 5. L. | April 6. H. | April 6. L. | Sales. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Advance M & M. Co. | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Albion, s. L. | Nevada | $15,000,000 | 150,000 | $100 | $547,500 | March | 1883 | .50 | | | | | | | | | | | | | | S. F. |
| 3 | Allouez, C. | Michigan | 2,000,000 | 80,000 | 25 | 200,000 | January | 1883 | | | | | | | | | | | | | | | B. |
| 4 | Alpha Con., G. S. | Nevada | 3,000,000 | 30,000 | 100 | 420,000 | March | 1882 | .50 | | | | | | | | | | | | | | S. F. |
| 5 | Alta, S. | Nevada | 10,080,000 | 100,800 | 100 | 1,392,090 | January | 1883 | .25 | | | | | | | | | | | | | | S. F. |
| 6 | Alta-Montana, G. S. L. | Montana | 5,000,000 | 500,000 | 10 | | | | | .09 | .08 | .08 | ... | .09 | .08 | .09 | .08 | .... | .... | .08 | .... | 7,500 | |
| 7 | American Flag, S. | Colorado | 1,250,000 | 125,000 | 10 | 300,000 | June | 1877 | .25 | | | | | .03 | | | | | | | | 100 | |
| 8 | Barcelona, G. | Nevada | 200,000 | 200,000 | 25 | * | | | | .17 | | .15 | ... | .15 | | | | | | | | 900 | |
| 9 | Battle Creek | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Bear Creek | California | 300,000 | 300,000 | 1 | | | | | | | | | | | | | | | | | | |
| 11 | Beauce | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Bechtel Con., G. | California | 10,000,000 | 100,000 | 100 | 185,000 | January | 1883 | .10 | | | | | | | | | | | | | | S. F. |
| 13 | Best & Belcher, G. S. | Nevada | 10,080,000 | 100,800 | 100 | 1,345,790 | November | 1882 | .50 | | | | | | | | | | | | | | S. F. |
| 14 | Big Pittsburg, S. L. | Colorado | 20,000,000 | 200,000 | 100 | * | | | | | | | | .17 | .15 | .16 | .15 | .... | .... | .... | .... | 1,700 | |
| 15 | Black Jack, G. | California | 250,000 | 100,000 | 2½ | | | | | | | | | | | | | | | | | | |
| 16 | Bonanza Chief | Montana | 1,000,000 | 1,000,000 | 1 | * | | | | | | | | | | | | | | | | | |
| 17 | Bonanza King, G. S. | California | 1,000,000 | 10,000 | 100 | * | | | | | | | | | | | | | | | | | |
| 18 | Bondholder | Colorado | 500,000 | 200,000 | 2½ | | | | .25 | | | | | | | | | | | | | | |
| 19 | Boston Con., G. | California | 10,000,000 | 100,000 | 100 | 95,000 | October | 1882 | | | | | | | | | | | | | | | |
| 20 | Boulder Con. | Colorado | | | | | | | | | | | | | | | | | | | | | |
| 21 | Bradshaw, S. | Arizona | 2,250,000 | 225,000 | 10 | | | | | .30 | | .30 | | .30 | | .30 | 29 | .30 | .28 | .... | .... | 5,300 | |
| 22 | Buckeye | Colorado | 2,000,000 | 400,000 | 5 | * | | | | | | | | .02 | | | | .02 | | .02 | | 1,100 | |
| 23 | " preferred | Colorado | | | | | | | | | | | | | | | | | | | | | |
| 24 | Bull-Domingo, S. L. | Colorado | 10,000,000 | 200,000 | 50 | * | | | | | | | | | | | | | | | | | |
| 25 | Bullion, G. S. | Nevada | 10,000,000 | 100,000 | 100 | 3,747,000 | October | 1882 | .50 | | | | | | | | | | | | | | S. F. |
| 26 | Bye and Bye | Arizona | 1,000,000 | 100,000 | 10 | * | | | | | | | | | | | | | | | | | |
| 27 | Calaveras, G. | California | 500,000 | 500,000 | 1 | * | | | | | | | | | | | | | | | | | |
| 28 | Cal. W'r & M. Co., G. | California | | | | | | | | | | | | | | | | | | | | | |
| 29 | Caledonia, S. H., G. | Dakota | 10,000,000 | 100,000 | 100 | 480,000 | August | 1882 | .15 | | | | | | | | | | | | | | |
| 30 | Catskill, S. | Nevada | 1,500,000 | 300,000 | 5 | | | | | | | | | | | | | | | | | | |
| 31 | Central Arizona, S. | Arizona | 10,000,000 | 100,000 | 100 | | | | | .33 | .32 | .33 | .30 | .31 | .30 | | | .30 | .... | .33 | .30 | 3,300 | B. |
| 32 | Chapparal | California | | | | | | | | | | | | | | | | | | | | | |
| 33 | Cherokee, G. | California | 1,500,000 | 150,000 | 10 | | | | | .03 | | .03 | .02 | .02 | | .02 | | .02 | | .02 | | 19,600 | |
| 34 | Cholla, S. | Nevada | 11,200,000 | 112,000 | 100 | 521,000 | March | 1883 | .50 | | | | | | | | | | | | | | S. F. |
| 35 | Colorado Central, S. | Colorado | 3,000,000 | 300,000 | 10 | | | | | | | | | | | | | | | | | | |
| 36 | Columbia Con., G. S. | Nevada | 5,000,000 | 100,000 | 50 | | | | | | | | | | | | | | | | | | |
| 37 | Con. Imperial, G. S. | Nevada | 50,000,000 | 500,000 | 100 | 1,425,000 | January | 1882 | .10 | | | | | | | | | | | | | | |
| 38 | Con. Pacific, G. | California | 6,000,000 | 60,000 | 100 | 141,000 | August | 1882 | .25 | | | | | | | | | | | | | | |
| 39 | Crescent, S. L. | Colorado | 3,000,000 | 300,000 | 10 | * | | | | | | | | | | | | | | | | | B. |
| 40 | Crowell, G. | North Car. | 500,000 | 500,000 | 1 | | | | | .04 | | | | .03 | | .04 | | | | | | 4,700 | |
| 41 | Dahlonega, G. | Georgia | 250,000 | 250,000 | 1 | * | | | | | | | | | | | | | | | | | |
| 42 | Dardanelles, G. | California | 1,000,000 | 100,000 | 10 | * | | | | | | | | | | | | | | | | | |
| 43 | Decatur | | | | | | | | | | | | | | | | | | | | | | |
| 44 | Dunderberg, S. | Colorado | 1,500,000 | 150,000 | 10 | * | | | | .06 | .05 | .05 | .... | .06 | .04 | .06 | .05 | .... | .... | .05 | .... | 36,100 | |
| 45 | Durango, G. | Colorado | 500,000 | 500,000 | 1 | * | | | | | | | | | | .25 | | | | | | 100 | |
| 46 | Eastern Oregon | | | | | | | | | .06 | .05 | .06 | .05 | | .03 | .06 | | .70 | .... | .75 | .... | 2,800 | |
| 47 | Elko Con., S. | Nevada | | | | | | | | | | | | | .03 | | | | | | | 2,400 | |
| 48 | Empire, S. | Utah | 10,000,000 | 100,000 | 100 | | | | | .13 | .12 | .11 | .10 | .10 | .09 | .11 | .10 | .10 | .... | .10 | .09 | 20,100 | |
| 49 | Enterprise | Colorado | | | | | | | | | | | | | | | | | | | | | B. |
| 50 | Exchequer | Nevada | 10,000,000 | 100,000 | 100 | 630,000 | January | 1882 | .25 | .25 | | .24 | .... | .25 | .24 | .26 | .25 | .27 | .26 | .29 | .27 | 15,100 | |
| 51 | Fannie Barret, S. | Colorado | | | | | | | | 2.20 | .... | 2.20 | .... | 2.25 | 2.20 | 2.20 | .... | .... | .... | .... | .... | 700 | |
| 52 | Globe Copper | Arizona | | | | | | | | | | | | | | | | | | | | | |
| 53 | Gold Placer, G. | Colorado | 5,000,000 | 200,000 | 25 | * | | | | | | | | | | | | | | | | | |
| 54 | Goodshaw, G. | California | 10,000,000 | 100,000 | 100 | 200,000 | October | 1882 | .10 | | | .04 | .... | .04 | | .04 | .... | .... | .... | .... | .... | 1,500 | |
| 55 | Granville, G. | North Car. | 300,000 | 300,000 | 1 | * | | | | | | | | | | | | | | | | | |
| 56 | Harlem M. & M. Co., G. | California | | | | | | | | 1.50 | 1.45 | 1.45 | 1.40 | 1.45 | .... | 1.45 | .... | 1.50 | 1.45 | 1.45 | .... | 6,500 | B. |
| 57 | Harshaw, S. | Arizona | 10,000,000 | 100,000 | 100 | | | | | | | | | | | | | | | | | | |
| 58 | Head Center, S. | Arizona | 5,000,000 | 200,000 | 25 | 160,000 | May | 1882 | .20 | | | | | | | | | | | | | | |
| 59 | Hortenae, S. | Colorado | 2,000,000 | 200,000 | 10 | | | | | .12 | | | | | | | | .12 | .11 | .... | .... | 1,000 | |
| 60 | Julia, G. S. | Nevada | 11,000,000 | 110,000 | 100 | 1,394,000 | January | 1882 | .20 | | | | | | | | | | | | | | |
| 61 | Kossuth, G. S. | Nevada | 10,800,000 | 108,000 | 100 | 421,200 | August | 1877 | .15 | | | | | | | | | | | | | | |
| 62 | Lacrosse, G. | Colorado | 1,000,000 | 100,000 | 10 | * | | | | .14 | | .15 | .14 | .15 | .14 | .15 | .14 | .15 | .14 | .12 | .... | 12,600 | |
| 63 | Leviathan, S. | Nevada | 10,000,000 | 100,000 | 100 | 380,000 | September | 1882 | .25 | | | | | | | | | | | | | | |
| 64 | Lucerne, S. | Colorado | 5,000,000 | 500,000 | 10 | * | | | | | | | | | | | | | | | | | |
| 65 | Mariposa pref., G. | California | 5,000,000 | 50,000 | 100 | 1,887,500 | December | 1881 | | | | | | | | | | | | | | | |
| 66 | " common, G. | California | 10,000,000 | 100,000 | 100 | 1,975,000 | February | 1883 | .25 | | | | | | | | | | | | | | |
| 67 | May Belle, G. | California | 10,000,000 | 100,000 | 100 | 84,000 | December | 1881 | .20 | | | | | | | | | | | | | | |
| 68 | Mayflower, S. | Colorado | 10,000,000 | 100,000 | 100 | * | | | | | | | | | | | | | | | | | |
| 69 | Mexican, G. S. | Nevada | 10,000,000 | 100,800 | 100 | 2,269,000 | February | 1883 | 1.00 | 3.00 | 2.88 | 3.00 | .... | 3.13 | 2.88 | 3.13 | 2.90 | 3.00 | 2.88 | 3.13 | 3.00 | 3,710 | S. F. |
| 70 | Michoacan Synd. | Mexico | | | | | | | | | | | | | | | | | | | | | |
| 71 | Miner Boy, G. S. L. | Colorado | 5,000,000 | 500,000 | 10 | * | | | | | | | | | | .02 | .... | .02 | .... | .... | .... | 300 | |
| 72 | Miller | Nevada | 5,000,000 | 200,000 | 25 | | | | | | | | | | | | | | | | | | |
| 73 | Mono, G. | California | 5,000,000 | 50,000 | 100 | 535,000 | January | 1883 | .20 | | | | | | | | | | | | | | S. F. |
| 74 | Moose Silver, S. | Colorado | 3,000,000 | 300,000 | 10 | * | | | | | | | | | | | | | | | | | |
| 75 | Moulton, G. S. | Montana | 10,000,000 | 400,000 | 25 | * | | | | | | | | | | | | | | | | | |
| 76 | Nevada Syndicate | | | | | | | | | | | | | | | | | | | | | | |
| 77 | North Standard, G. | California | 10,000,000 | 100,000 | 100 | 20,000 | November | 1881 | .10 | | | | | | | | | | | | | | |
| 78 | North Horn-Sil., S. L. | Utah | | 400,000 | | | | | | | | | | | | | | | | | | | |
| 79 | Noonday | California | 600,000 | 60,000 | 10 | 208,000 | December | 1882 | 1.00 | | | | | | | | | | | | | | S. F. |
| 80 | Old Dominion, C. | Arizona | 20,000,000 | 200,000 | 100 | * | | | | | | | | | | | | | | | | | |
| 81 | Oriental | Nevada | 2,000,000 | 200,000 | 10 | | | | | | | | | | | | | | | | | | |
| 82 | Oriental & Miller, S. | Nevada | 10,000,000 | 400,000 | 25 | | | | | .16 | .15 | .16 | .15 | .16 | .15 | .16 | .15 | .16 | .15 | .18 | .17 | 32,100 | |
| 83 | Overman, G. S. | Nevada | 11,520,000 | 115,200 | 100 | 3,804,700 | May | 1882 | .25 | | | | | | | | | | | | | | S. F. |
| 84 | Potosi | Nevada | 10,800,000 | 112,000 | 100 | 500,840 | November | 1882 | .25 | | | | | | | | | | | | | | S. F. |
| 85 | Quartz Creek | | | | 100 | | | | | | | | | | | | | .02 | .01 | .02 | .... | 4,500 | |
| 86 | Rappahannock, G. | Virginia | | 250,000 | | * | | | | .08 | | .08 | | .08 | | | | | | | | 1,400 | |
| 87 | Red Elephant, S. | Colorado | 500,000 | 500,000 | 1 | * | | | | .07 | .06 | .07 | .... | .07 | .... | .07 | .... | .06 | .... | .... | .... | 3,300 | |
| 88 | Retort M. & M. Co. | Colorado | | | 10 | | | | | | | | | | | | | | | | | | |
| 89 | San Pedro, G. S. L. | New Mex. | | 400,000 | | | | | | | | | | | | | | | | | | | |
| 90 | Silver Cliff, S. | Colorado | 5,000,000 | 200,000 | 25 | * | | | | .35 | .33 | .35 | .... | .35 | | | | | | | | 1,300 | B., P. |
| 91 | Silver Islet | Canada | 1,000,000 | 40,000 | 25 | | | | | | | | | | | | | | | | | | |
| 92 | Sonora Con. | Mexico | | | | | | | | .48 | .... | .47 | .46 | .50 | .46 | .53 | .48 | .52 | .40 | .45 | .35 | 39,800 | |
| 93 | South Bodie, G. | California | | 100,000 | | 100,000 | March | 1882 | .15 | | | | | | | | | | | | | | |
| 94 | South Bulwer, G. | California | 10,000,000 | 100,000 | 100 | 195,000 | May | 1881 | .25 | | | | | | | | | | | | | | |
| 95 | South Hite | California | 10,000,000 | 100,000 | 100 | | January | 1883 | .05 | | | | | .25 | .20 | .28 | | | | | | 2,500 | |
| 96 | South Pacific | California | | | 5 | | | | | .06 | | .06 | .05 | .05 | | .06 | .05 | .... | .... | .06 | .05 | 11,000 | |
| 97 | State Line, No. 1, S. | Nevada | | 200,000 | 1 | | | | | | | | | | | | | | | | | | B. |
| 98 | " No. 2, S. | Nevada | 5,000,000 | 200,000 | 25 | | | | | | | | | | | | | | | | | | |
| 99 | " No. 3, S. | Nevada | 5,000,000 | 200,000 | 25 | | | | | | | | | | | | | | | | | | |
| 100 | " No. 4, S. | Nevada | 5,000,000 | 200,000 | 25 | | | | | | | | | | | | | | | | | | |
| 101 | " Nos. 1 and 4, S. | Nevada | | | 25 | | | | | .03 | .02 | | | | | | | | | .02 | | 5,200 | |
| 102 | " Nos. 2 and 3, S. | Nevada | | | | | | | | .06 | .04 | | | | | | | .05 | | .05 | | 6,100 | |
| 103 | Sullivan, G. S. L. | Maine | 500,000 | 100,000 | 5 | 125,000 | December | 1882 | .25 | | | | | | | | | | | | | | |
| 104 | Sutro Tunnel | Nevada | | 2,000,000 | | * | | | | .20 | | .20 | .18 | .20 | .19 | .20 | | .20 | | .21 | .20 | 14,750 | B. |
| 105 | Taylor-Plumas | California | | | 10 | | | | | | | .17 | | .17 | | .18 | | .17 | | .17 | | 5,500 | B., P. |
| 106 | Tioga, G. | California | 10,000,000 | 100,000 | 100 | 285,000 | October | 1882 | .10 | | | | | | | | | | | | | | |
| 107 | Tuscarora, S. | Nevada | 10,000,000 | 100,000 | 100 | 110,000 | October | 1881 | .15 | | | | | | | | | | | | | | |
| 108 | Unadilla, S. | Colorado | 50,000,000 | 500,000 | 100 | * | | | | | | | | | | | | | | | | | |
| 109 | Union Con., G. S. | Nevada | 10,000,000 | 100,000 | 100 | 1,570,000 | January | 1883 | 1.00 | | | 3.50 | .... | | | 3.40 | .... | | | | | 200 | |
| 110 | Utah, S. | Nevada | 2,000,000 | 20,000 | 100 | 1,380,000 | February | 1883 | 1.00 | | | | | | | | | | | | | | S. F. |
| 111 | Vandewater | Nevada | 20,000,000 | 200,000 | 100 | * | | | | | | .19 | .... | | | | | | | | | 500 | |
| 112 | Washington | Arizona | 2,000,000 | 200,000 | 10 | | | | | | | | | .07 | .... | | | | | | | 500 | |
| 113 | Whalen Copper | Nevada | 2,500,000 | 100,000 | 25 | | | | | | | | | | | | | | | | | | |
| 114 | Wide West | | | | | | | | | | | | | | | | | | | | | | |
| 115 | Willshire | California | 250,000 | 50,000 | 5 | * | | | | | | | | | | | | | | | | | |

G. Gold. S. Silver. L. Lead. C. Copper. * Non-assessable. † Stocks quoted on S. F., San Francisco; B., Boston; P., Philadelphia. Non-Dividend shares sold, 280,760. Total shares sold, 421,415.

greater steadiness in the market of the metal may be expected. Other brands are offered at prices varying from 14·90@15·75c. We learn that a large Western producer of standard copper declined an offer for export from a point on the southwestern coast, and sold one million pounds to an Eastern refiner. If, as we learn, the price for export was a little better, it is to be regretted that such an important lot was not sent away. English quotations are unfavorable, Chili Bars having fallen off to £64@£64 10s. against £65 10s. last week, while Best Selected remains nearly the same, £72@£72 5s. Lake generally brings considerably more than Best Selected, the last sale, a few weeks ago, of 1500 tons, realizing £77. We discuss editorially some of the points suggested by the situation.

Under date of March 22d, Vivian, Younger & Co., of London, quote ores and regulus at Liverpool or Swansea, 13s.@13s. 6d. per unit, delivered in warehouse.

**Tin.**—The market has been unsettled, with little business transacted. London dropped to £94 yesterday, but reacted to £95 10s. to-day. At the close, 20¾c. is bid and 21⅛c. asked for spot Straits.

**Lead.**—The situation is unsettled temporarily, and, during the first four days of the week the continuance of negotiations between a pool of buyers offering to take 3500 tons at 4·40c., of Richmond lead, kept matters in suspense. Since then, common lead has been offered freely for April delivery at 4·40c.; but

as most large consumers are tolerably well stocked for this and a part of the coming month, it has not resulted in any business. Refined is procurable at 4·55@4·60c. During the month, 700 tons of Germania lead are due, which will probably be sold on arrival.

Messrs. John Wahl & Co., of St. Louis, wire us as follows to-day :

We note eight sales, during the early part of the week, of 110 tons Refined, at 4·12½c. and 4·15c., and Wednesday, 230 tons of Chemical Lead, at 4·12½c. Receipts were 600 tons, against 500 tons last week.

**Spelter.**—This market is very quiet, with values falling off slightly. We quote : 4·70@4·80c. for Common Domestic.

Preliminary estimates of the production of spelter in Siberia for 1882 place the make at 69,964 metric tons, compared with 67,547 tons in 1881, an increase of 2417 tons.

**Antimony.**—Business has been slow, our quotations being 10c. for Hallett's and 10⅞@11c. for Cookson's.

## BULLION MARKET.

New York, Friday Evening, April 6.

The completion of a small continental order for silver, and a decline in India exchange, have induced lower rates in London ; but an advance in sterling exchange here has nearly met this, as our figures show. The market is not strong.

| Date. | London Pence. | N. Y. Cents. | Date. | London Pence. | N. Y. Cents. |
|---|---|---|---|---|---|
| March 31.. | * | 110⅜ | April 4.... | 50¾ | 110 |
| April 2.... | 50⅞ | 110⅛ | 5.... | 50¾ | 110⅛ |
| 3.... | 50 13-16 | 110⅛ | 6.... | 50¾ | 110¼ |

* 51@51 1-16.

*Bullion Receipts at New York.*—The bullion received from the mines at the various offices in this city during the week ended April 6th, as compiled from various sources, amounted to $236,000, as against $146,644.34 reported for the previous week. The receipts from January 1st, 1883, to date are $3,818,208.08.

*Exports and Imports of Gold and Silver at New York.*

*Exports.*

| | |
|---|---|
| Week ended March 31st | $539,700 |
| Corresponding week last year | 310,450 |
| Since January 1st, 1883 | 4,144,610 |
| Corresponding period last year | 13,061,753 |

*Imports.*

| | |
|---|---|
| Week ended March 31st | $693,798 |
| Corresponding week last year | 144,044 |
| Since January 1st, 1883 | 8,846,467 |
| Corresponding period last year | 1,085,613 |

*Foreign Bank Statements.*—The governors of the Bank of England, at their weekly meeting, made no change in the rate of discount, which remains 3 per cent. The outside rate is fully up to the bank rate. The bank lost during the week £378,000 bullion, and the proportion of reserve to liabilities was reduced from 38¼ last week to 34 5-16, against 36⅝ at the same time last year. The weekly statement of the Bank of France shows a decrease of 1,850,000 francs in gold and 500,000 francs in silver.

*Silver Coinage Allotments.*—Owing to the large accumulation of silver coin at the San Francisco Mint, the Director of the Mint has ordered that the coinage allotment for that mint for the month of April be fixed at $400,000, which is $200,000 less than the allotment for March. The coinage at the Philadelphia and New Orleans mints will be correspondingly increased.

## IRON MARKET REVIEW.

New York, Friday Evening, April 6.

At the Wall Street Iron and Metal Exchange, the following directors were elected : Theodore Sturges, President ; John C. Cook, Treasurer ; William Allen Smith, Secretary ; A. W. Humphreys, James Hall, F. L. Lehmann, B.F. Judson, J. Fred. Pierson, William Houston, Daniel F. Cooney, Morton B. Smith, T. D. Hazard, James E. Pope.

**American Pig.**—Apathy still continues, but still prices are tolerably well maintained on the part of increasing stocks. The demand, however, is slacker at the seaboard than in the interior, where large quantities of forge iron are used, and of the sale of which we hear little. There is an entire absence of speculation, and the producers and consumers, being pretty wide apart in their views, show no inclination to give up their respective positions. The makers of other than standard brands of foundry irons are, however, weaker and make concessions. We quote $22.50@$24.50 for No. 1. Foundry, ordinary to choice; $21.50@$22.50 for No. 2 ; and $19@$20 for Gray Forge. Bessemer pig sales aggregating 10,000 tons are reported at a price equivalent to $21.75 here; quotations range from $21.50 bid to $22 asked. Spiegeleisen has been more active, at $32 for 20 per cent, and $26 for 12 to 15 per cent.

**Scotch Pig.**—The only feature worthy of special comment is the falling off in the arrivals. Freights are still low from Glasgow ; they have, however, stiffened from Liverpool to 10s. Business is on a small scale only. We quote Coltness and Langloan, $24@$24.50 ; Glengarnock, $22@$22.50 ; and Eglinton, $21@$21.50. At the Wall Street Exchange, the following cables were received to-day : Carnbroe, 55s. 3d.; Gartsherrie and Summerlee, 61s. 6d.; Coltness, 64s.; Langloan, 64s. 3d.; Glengarnock, 54s. 9d.; and Eglinton, 49s. Warrants are 46s.

**Rails.**—There is a fair inquiry for small lots, and we note sales aggregating from 5000 to 6000 tons at $39 at mill.

**Old Rails.**—No business of any magnitude has been done, except a sale of 300 tons of D. Hs. at $28. We quote Ts $23.50@$24, and D. Hs. spot $28, with very little here.

**Scrap.**—Scrap is dull and lifeless at $25 ex ship.

**Philadelphia.** April 6.

*Pig-Iron.*—Representatives of standard brands of pig-iron have made a number of satisfactory sales at $20 for Gray Forge, $24.50@$25 for No. 1, and $24 for poor quality, with occasional transactions at less. No. 2 sold higher and lower this week than usual. The concessions which pig-iron men have been finally induced to make led to a good deal of businesss, and more is going through. Furnace stocks have been pretty well depleted by contracts placed, but deliveries extend over the second quarter of the year. Some mill iron sold at $18.50@$19 at furnace.

*Merchant Iron.*—The rolling-mill owners are not satisfied with current rates for finished bars, but they can not help themselves at present. The average price for Refined Bars is 2·25c. ; Ordinary 2@2·10c. A strike is not out of the question, as the Western manufacturers contemplate a 10 to 20 per cent reduction. Such a course would bring about an artificial scarcity, and in view of possible complications, a number of inquiries for large supplies have been heard of. Skelp iron is 2¼@2½c., with concessions. Nails are in good demand at $3.15@$3.30. Bridge and boiler plate is active, and inquiries for summer requirements for common plate and structural iron are under consideration.

*Sheet-Iron.*—Plain and galvanized has met with more inquiry, but the general character of trade is retail.

*Steel.*—Steel is improving, but sales of large lots are made at concessions.

*Steel Rails.*—Some few large orders have been placed in Bessemer mills under $39. The total sales for the week reported from all quarters are large. Small lots, $39@$40.

*Old Rails.*—Tees are quoted $24.50 in small lots, and Double Heads, $28.

*Scrap.*—Moderate demand at $25@$26 for No. 2 ; $27@$28 for No. 1.

## COAL TRADE REVIEW.

### Anthracite.

New York, Friday Evening, April 6.

The situation has not materially changed. Not withstanding the unshaken determination of the great coal companies to keep the production within the limits of the demand, and the inference to be drawn from it that they will not go lower in prices, consumers appear almost to a man to have the idea that they will do much better by waiting. How far this policy is a wise one remains to be seen, especially when it is considered that freights are exceptionally low, charters being made to Boston at $1 and to Providence at 70 cents. The Eastern trade so far has been a disappointment, much more so than the local trade, which has been fair in the aggregate. Here the complaints come principally from the middlemen, who appear to be left out in the cold. Coal is accumulating now, waiting for the opening of lake navigation, when a strong movement to the West is expected ; those markets being practically bare of anthracite.

The production of the present year is creeping up at a rate of increase over the last of about 15 per cent. The restriction ordered by the coal companies, however, will keep this increase within the bounds set by the growth of the demand.

### Bituminous.

As a slightly encouraging sign after the deadness of the past few weeks, it may be noted that there are at least occasional inquiries. We understand that several of the larger contracts are in the market, but none has as yet been closed. Low offerings of coal continue to be made, some of the figures we hear of being surprising. They can only be accounted for, so far as Cumberland is concerned, by the low cost of putting coal on board at Georgetown, where coal is held at $3.20@$3.25, leaving a good profit for shippers. We quote Clearfield nominally $4.40@$4.50, and Cumberland $4.50@$4.60, though we hear of transactions at lower figures.

From Philadelphia, a correspondent sends us the following, under date of April 5th :

This is a short week, and it has been decided to continue the curtailment next week. The purchasers are not coming forward as it was natural to expect they would, after a long winter and active consumption. A feeling that coal may be lower prevails, notwithstanding the determination shown by the trade not to crowd the market with surplus coal. The prices, particularly of stove, both at tide and to the local trade, are higher than last year at this time, and account for the reluctance of buyers to order freely. The companies are waiting, knowing they will have to come ; and it is expected that the moment the Western outlet is open, buyers will get a practical demonstration that rates can be maintained.

Vessels are scarce, but orders not being plenty, the freights remain what they were last week, and low freights seem to be expected by the best informed.

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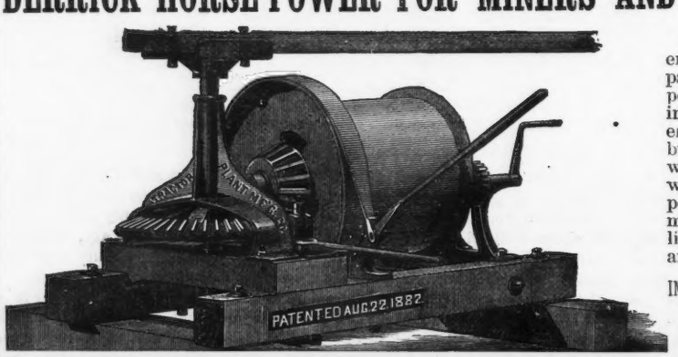


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